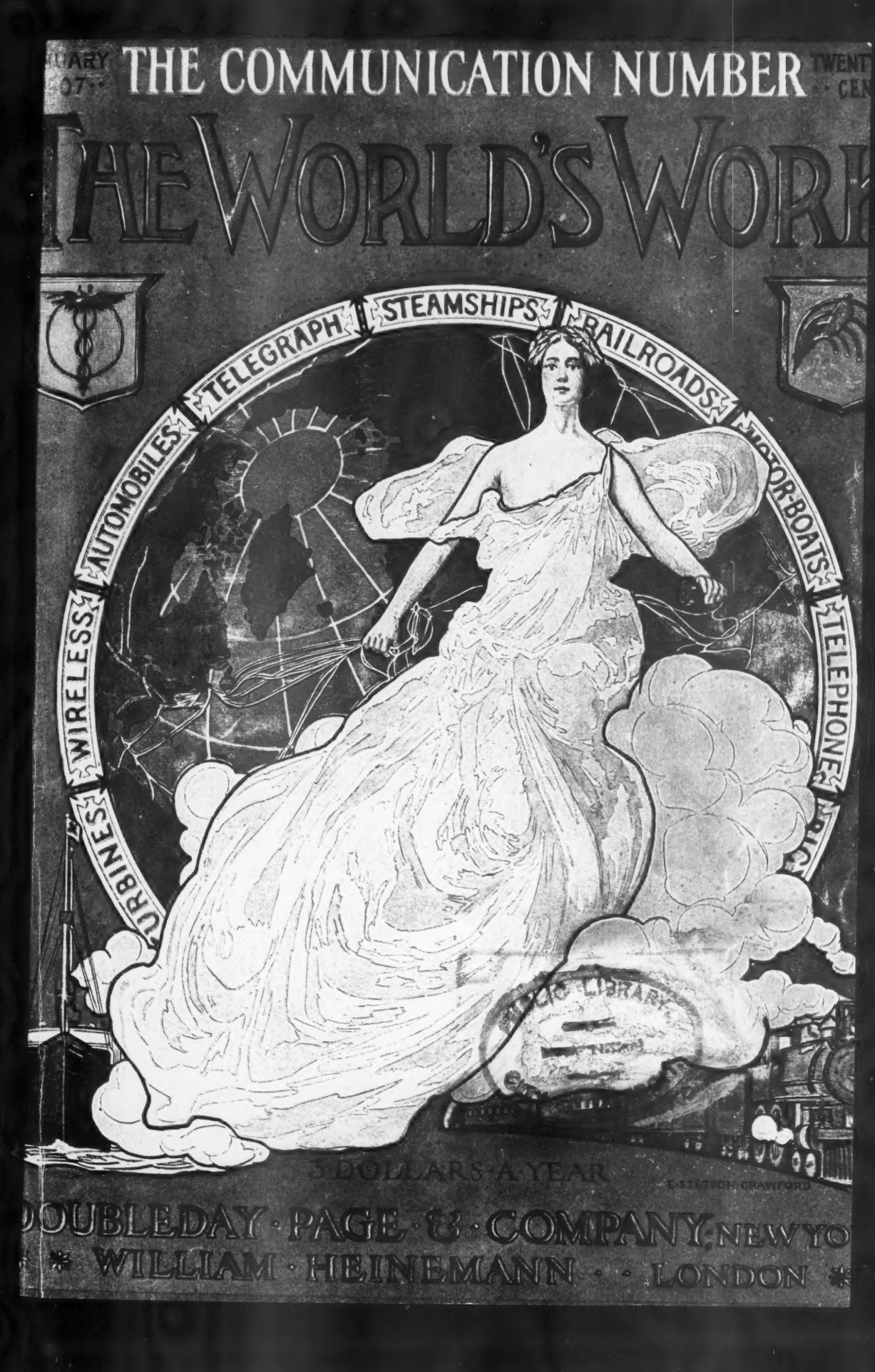
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The World's Work

WALTER H. PAGE, EDITOR

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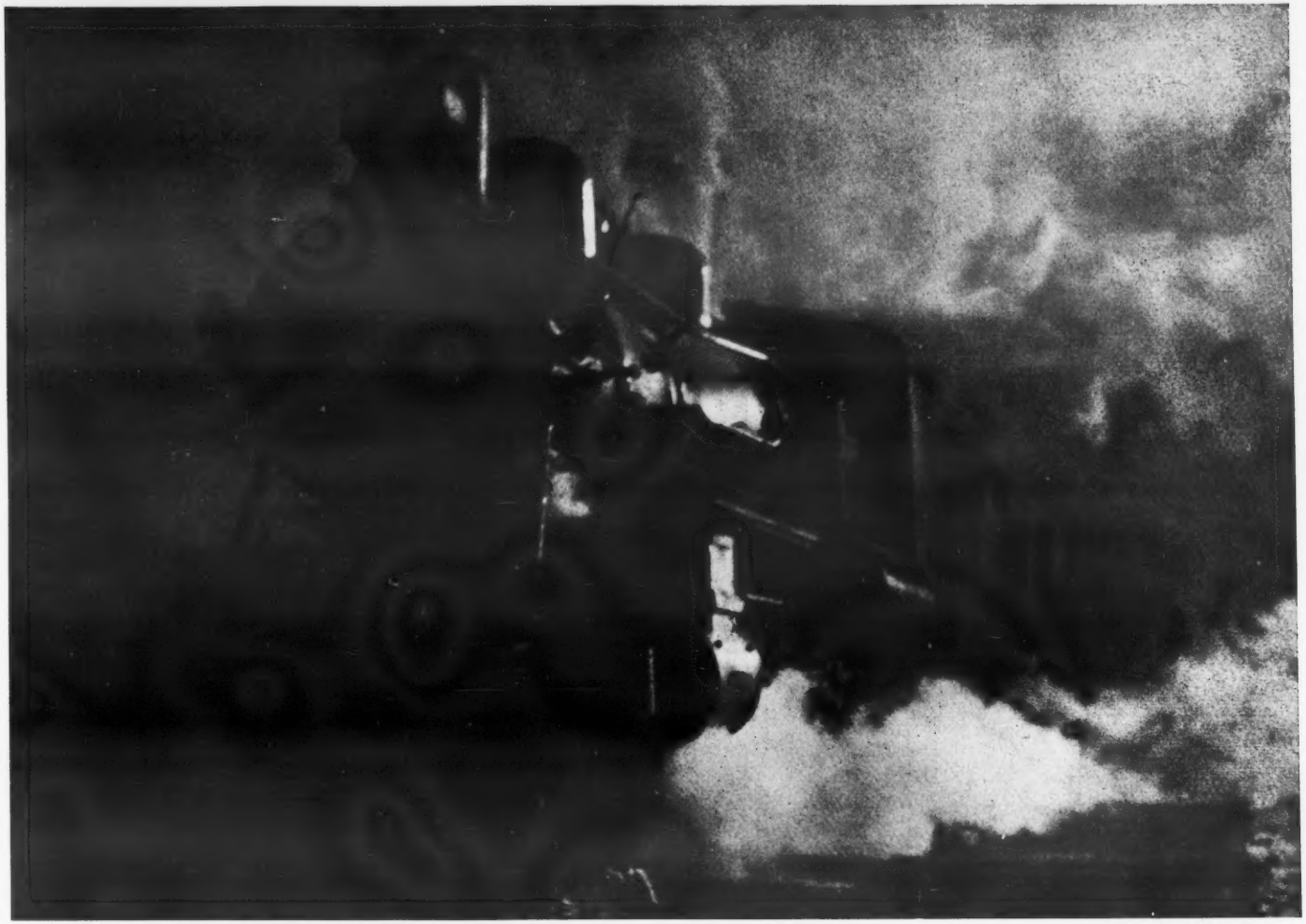
Country Life in America Farming The Garden Magazine

CHICAGO 1515 Heyworth Building **DOUBLEDAY, PAGE & COMPANY,** NEW YORK 133 East Sixteenth Street



THE SPIRIT OF STEAM

Photograph by Herbert E. Angell

THE WORLD'S WORK

JANUARY, 1907

VOLUME XIII NUMBER 3

The Communication Number

WHAT better way to welcome the New Year, which promises to be a year of wonders, as the Old Year was, than by presenting some of the new achievements in travel and traffic and in communication? For having yet hardly become accustomed to using the telephone over a thousand miles and to telegraphing to ships in mid-ocean, we are now on the point of making manageable flying machines.

Yet, apart from revolutionary discoveries, such as these, we are all the while making such improvements in old ways of travel and traffic as to bring more startling changes in our living and our thought than we realize as we adapt ourselves to all this new mechanism day by day.

To bring together the stirring facts of progress which are grouped together in this magazine has been a pleasant, if difficult, task and a task, we hope, worth doing. Yet, of course, the half is not told.

Modern civilization differs from the civilizations of former periods chiefly by reason of swifter travel and communication. These have changed history and made the character alike of nations and of individuals radically different from what they would have been.

Obvious as this is when we look over a long period, it is not quite so easy to see that gradual improvements are having the same sort of miraculous effects on our character and thought. But for the transcontinental railroads, the states west of the Rocky Mountains would hardly have become integral parts of the Union, as they now are; and the greatest force in nationalizing the Southern States—in utterly obliterating sectional lines—has been the direct and the indirect work of swift and cheap communication. Hundreds of even more striking examples could be quoted from our own current history. New York City, to cite one such instance, was radically changed in its character and in the direction of its development, first by the elevated roads and now more lately by the subway. Similar forces are making country life as companionable and as comfortable as town life and far more healthful.

But it is not the philosophical aspects of the subject that are taken up in this number of THE WORLD'S WORK so much as the physical wonders themselves that are taking place all about us, in machinery for going through the air, on the earth and in the hitherto inaccessible parts of it, under the ground, and on and under the water. It is a day of marvels, of novel adventures, of triumphs, of the harnessing of new forces such as never came before. A dirigible flying apparatus, the application of the gas engine to land and water motors, and the turbine, the rapidly growing use of wireless telegraphy, the new applications of electricity—merely to mention these is to stir the imagination, and to enable even a dull mind to foresee the day when, thanks to such forces, the character of nations and of men will be so changed that the earth will indeed become as one neighborhood and man will be a brother to man more completely than any philosophical system has yet dared to predict. Communication will do what neither conquest by war nor by religion nor by systems of thought could have brought about. In this way, therefore, we celebrate the New Year.

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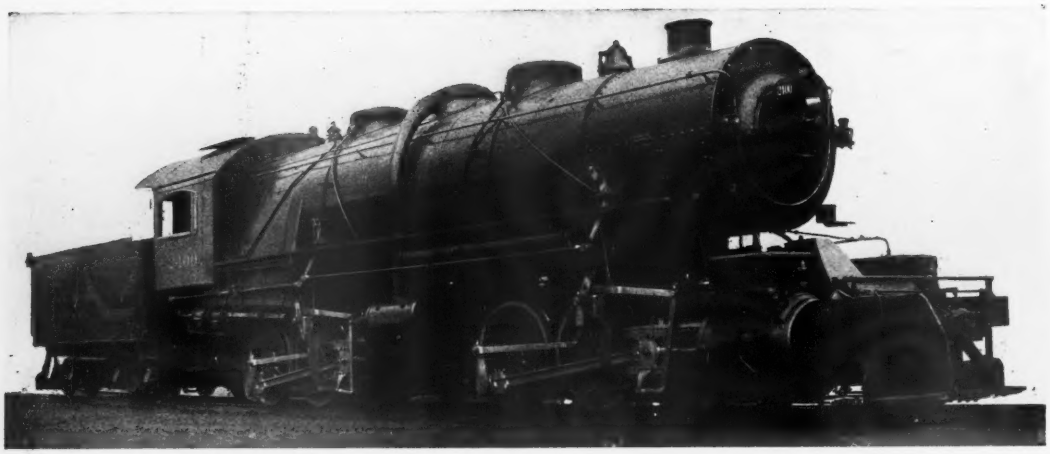
SANTOS-DUMONT AND HIS "BIRD OF PREY"

His recent successful flight, winning the Archdeacon prize, is a confirmation of the prophecy that man will soon fly at will

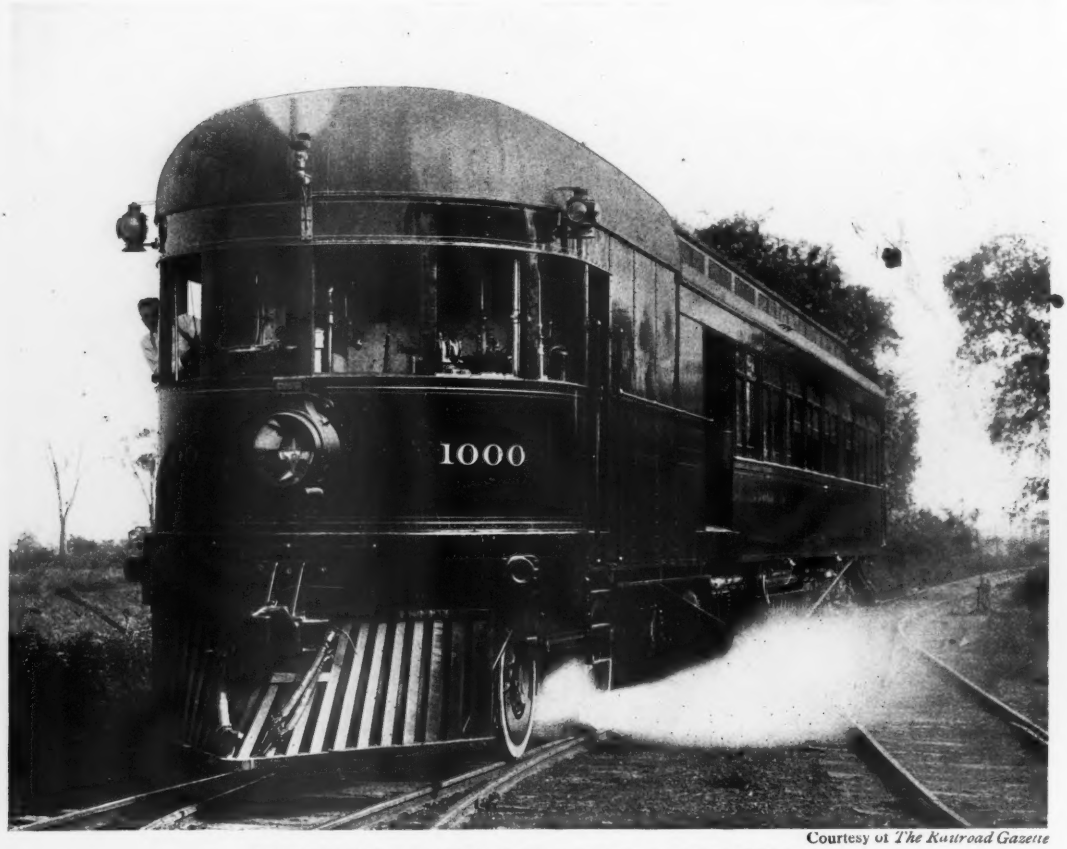
A RACING AUTOMOBILE CROSSING A FORD AT HIGH SPEED

There are now in use in the United States and Europe about 200,000 automobiles of various kinds, valued at about $200,000,000



THE MOST POWERFUL FREIGHT LOCOMOTIVE IN THE WORLD

The 167-ton freight engine of the Baltimore & Ohio Railroad, on its Connellsville division. Ordinary couplings will not hold the weight it is capable of hauling. It is used mainly for pushing heavy freight trains over the Alleghanies



Courtesy of *The Railroad Gazette*

THE RIVAL OF THE RAILROAD LOCOMOTIVE

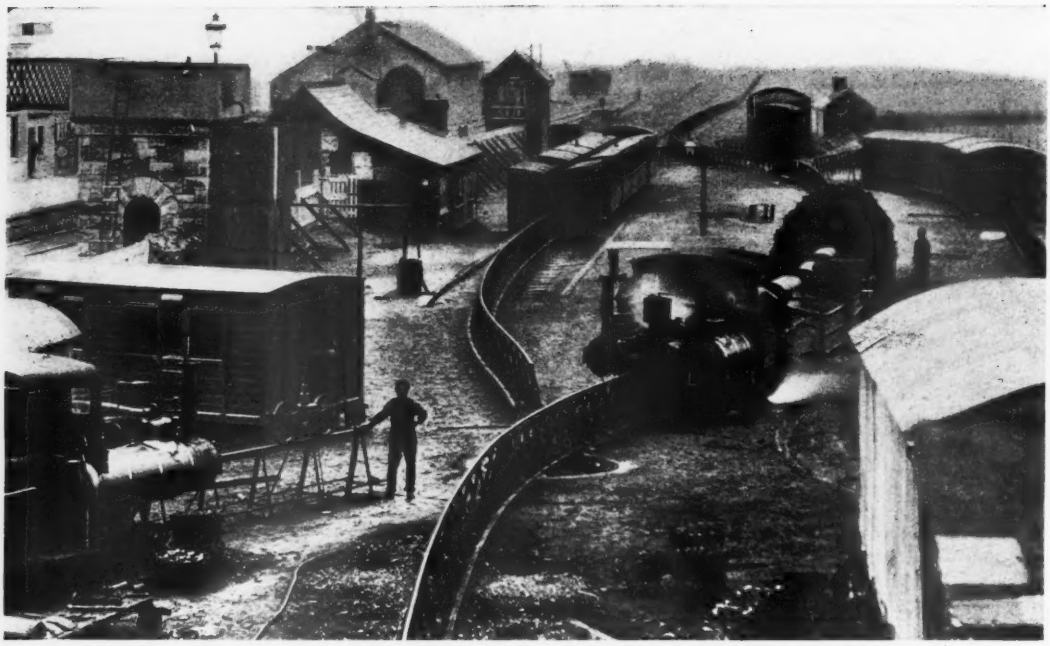
Steam-driven motor cars like this, gasoline motor cars, and motor cars driven by electricity generated by gasoline engines, are beginning to supersede the steam locomotive for light traffic

ELECTRICITY OUTRUNNING STEAM

A race on the New York Central Railroad in which the electric locomotive beat the steam locomotive a train's length in 500 yards, both starting from a standstill. This emphasizes one of the great advantages of electric traction in quick acceleration and quick stopping

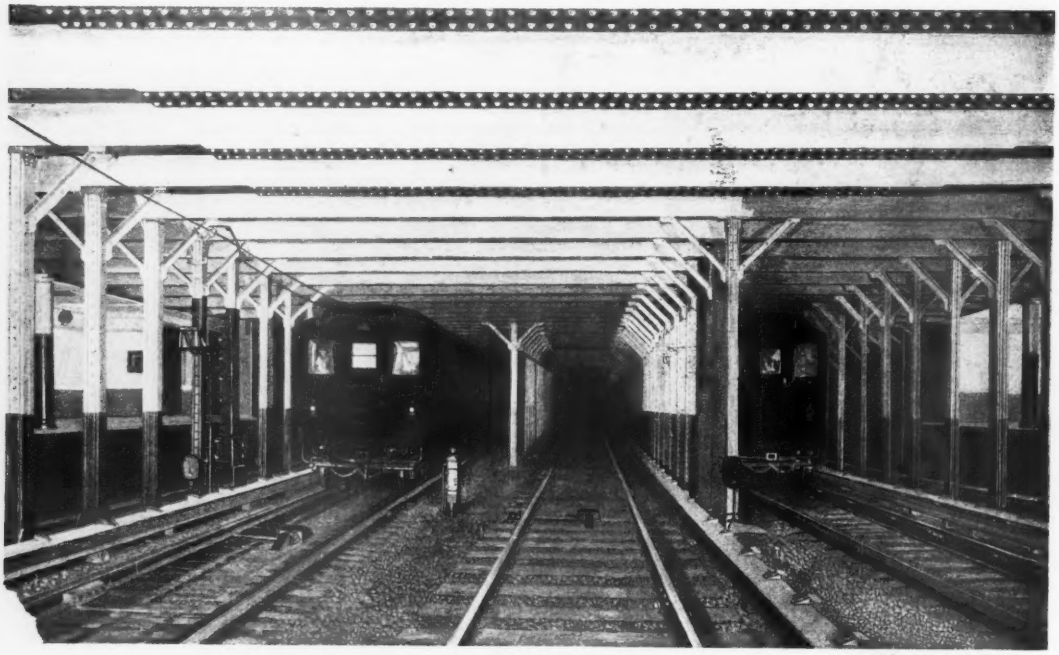
ROUNDING A CURVE ON THE BARMEN-ELBERFELD RAILWAY

This suspended elevated road is still an experiment but is probably one of the transportation methods of future. It has been in use in Germany for several years. It is said to be less noisy than an elevated line, there are no flooring or ties to shut out light or collect snow. No train can jump the track, no employee can run over, and the third rail is out of the way. It is claimed that a car with twice as many seats as a s car can be run at twice the speed for half the cost



A MONO-RAIL ROAD IN THE COUNTY KERRY, IRELAND

On the ten miles of this road from Ballybunnion to Listowell, there are 40 grade-crossings. A line resembling this is projected from New York to Coney Island



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THE NEW YORK SUBWAY, AT THE SPRING STREET STATION

1bway carried 116,200,000 passengers in 1905, 14,279,000 in one month (March, 1906), and 539,218 in one day (March 5, 1906). 7,400 cars pass Brooklyn Bridge Station in 24 hours.

The March of Events

WITH the coming of every new year in this period of marvelous prosperity, we fall to wondering how long it will continue. The growth of wealth, the very general diffusion of well-being, and the swift march of prosperity have taken away the old standards of judgment. We find ourselves in a new world. There are not railroads enough. There are not enough skilled workmen, nor enough day laborers. Agricultural land has risen as it never rose before. Cotton is higher than it has ever before been under normal conditions of trade. Yet the mills lack operatives. The farming states have more cash than they ever before had. Yet agricultural laborers are scarce. Measure the condition of the country in any fundamental way that you will and you find new and surprising sets of facts. Is it all normal and natural? Are we going on a straight and continuous road? Or shall we presently discover that we have been traveling in a circle?

Of course, many men and some communities are deceiving themselves about their own particular affairs. Every general movement of prosperity sets certain artificial forces going. But, in general, the people of the United States —and of all other energetic countries as well, but in our own country in particular—do seem to be rising rapidly to a new level of living and of working.

And if we sit down, as we ought, after the godly fashion of our forefathers, and thank Heaven for our manifold blessings, we shall find more reasons for gratitude even than their pious phrases described.

We have better methods of cultivating the land than men ever knew before, and methods of renewing its fertility.

We have better markets and more of them.

We have cheaper and swifter ways of reaching markets.

Our processes of manufacture continue to improve, alike in metals and textiles.

The organization of trade continues to become more exact in its workings.

We have better houses, better food, better clothing, better sanitary knowledge and practice.

The application of science to the practical betterment of life has been more noteworthy and widespread this last decade or two than during any preceding century.

These (and a thousand more things) have brought permanent new forces into activity, of which the old economics and the old statesmanship and the old piety knew nothing.

We may, then, look the New Year in the face cheerfully and welcome it with thankfulness and without fear.

GREAT FORTUNES HERE TO STAY

THERE is no evidence that our very rich men are greatly disturbed by the threats, made sometimes in high quarters and often in low, of prohibiting the accumulation or the transmission of large fortunes. If they are, any sound economist can reassure them. For there is no just way greatly to hinder the making of much money by men who have a genius for it. The income and the inheritance taxes of England have not appreciatively diminished the great British fortunes; and no tax that can justly be laid on wealth or on its inheritance will do more than these English taxes have done.

The danger lies not in great fortunes but only in the wrong methods of making or of using them. We have laws—perhaps enough laws if they could all be enforced—to prevent rich men from using the brutal force of wealth for illegitimate ends. Many such laws are not enforced; and many of the very great fortunes —perhaps most of them—have been made by some form of oppression, direct or indirect, legal or illegal.

But there are very many rich men who do not owe their wealth to such methods; and we are always going to have such men. More than that, we are always going to have rich families. The old saying that it takes only three generations to go from shirt-sleeves to shirt-sleeves is untrue. Every country of great opportunities and of capable men has produced families that have a genius for conserving as well as for accumulating wealth; and so has our country. The sons of the rich are not all spendthrifts.

The important thing is to distinguish between

the having of a fortune and the way in which a fortune is got or used. If it be honestly got and honestly used, wealth is to be desired and welcomed—and even great wealth is not to be feared. At any rate, it is more likely to cause trouble to its owner and his children than to the rest of the community. It is right to tax it, but it would be wrong to confiscate it. We cannot limit it if we would. We can only make sure that men shall honestly win it and honestly use it.

The sensible way to deal with rich men is to help them use their riches wisely and not to cry out against all wealth and thus drive them into a suspicious and useless and lonely class by themselves.

So far as the fiscal problem of the Government is concerned, we are likely sooner or later to come to this—a great lowering of the tariff, the imposition of a Federal income tax or an inheritance tax, or both, the gradual lessening of the vast pension payments, and the increased spending of money on vast internal improvements. And fairly and even heavily taxed wealth will properly contribute to this.

ARE WE REALLY GETTING RICHER?

WITHIN ten years the value of property in the United States has doubled. We now have property worth or "capitalized" at a hundred billion dollars. Divided per capita, every man, woman, and child in the United States would be worth $1,250. Divided among families, every family would have more than $6,000. Such a volume of wealth the world has never seen before, and the increase continues in a swelling flood. What does this mean? Anything more than a huge piece of statistical guesswork and calculation?

This more than threefold increase in values in the United States in thirty years is made up of two factors—increased value of the same things and more things of value. Every addition to the products of the farm is an increase in real wealth. So also, as we usually reckon it, is an increase in the value of the farm acreage. But these two increases are of a different nature; and the confusing of them in statistical statements of wealth tends to a misunderstanding of the economic processes which have been going on.

The question is, then, whether we are really growing richer at anything like the rate that the statistics indicate. Do these colossal and rapidly growing figures mean the creation of additional good things, the building of more houses, larger reserve food supplies, more machinery and factories, more clothing and furniture, more of all the things which are the results of labor combined with capital, put in shape for use? Or does this increased wealth represent an inflation, like the inflation during the Civil War, when every shopkeeper kept steadily marking up the price of his goods at a higher rate than the gold premium over the greenbacks?

II

In almost every industry that has been organized into a trust, a revaluation of the property has been made on an increased basis—in many cases at a threefold increase. The steel trust pays interest on bonds and dividends on stock which are said to aggregate more than three times the prior value of the furnaces, the rolling mills, the coke ovens, the ore, and the coal included in the consolidation. The anthracite coal monopoly is represented by a huge amount of railroad stocks that had little value ten years ago but that now sell in Wall Street at an average of almost twice their par. The pottery trust pays interest and dividends on more than the cost of building and equipping all its potteries. So do a hundred smaller trusts, whose market values depend not on the cost of their plants, but on their power to make profits and to pay interests and dividends.

The railroads, too, are a huge instance of this marking up of values. Thirty years ago all the capital of all the railroads of the United States, including all their stocks, all their bonds, and all their debts, was only 4½ billions. To-day their capital is 14 billions. Of course, more railroads have been built, but the capitalization of nearly all has been enormously increased. The market value has increased a great deal more. The average Wall Street quotation for the stock of the great railroad systems in 1877 was $40 a share, or two-fifths of par. To-day the average is more than 150—fifty per cent. above par, or nearly four times what it was thirty years ago. Valued at Wall Street quotations, the railroads are one-fifth of the wealth of the United States.

Now is this increase in railroad market values an increase in articles of value or only in their valuation? Is it an increase of permanent values or only of values that may decline? In ten years the mileage of the railroads increased from 175,508 to 211,074. This is an increase

of only one-fifth. The increase in miles of railroad per 1,000 inhabitants hardly varied at all. Wherein did the increase in value come? It was not all in more miles of track, or more stations. There were more cars and locomotives, but these could be replaced for less than one-tenth of the additional capitalization. Wherein does the additional value consist? Solely in the increase in earning power through the increased use of the whole community, or through increased charges on it.

III

Farm values tell a similar story. In their market value, the farms are worth about as much as the railroads. Their present valuation is an increase of more than one-third, even during the last five years. The increase in Illinois alone is three-quarters of a billion dollars. The average farm lands in that state would have sold in 1900 for $57.70 an acre. To-day they would sell for $81.89 an acre, and their market value is still increasing. This increase does not come from new houses and barns or fences and improvements, but simply from a rise in the market price. The grazing lands of Texas have risen in value in the last five years from $7.05 to $9.69 an acre. The sheep and cattle ranges of Montana have increased still more, from $6.45 to $14.51. The unimproved fields of Idaho have doubled in value. Is this increase in values an increase in wealth or a mere marking up of the price? Are these lands intrinsically and permanently worth any more? The Illinois corn fields do not produce more abundantly. The wheat fields of the Northwest have exhausted some of the fertility of the soil.

Or take still another kind of property. The fertility of the soil may be restored by scientific farming, by plowing under green crops, and by other methods of fertilizing. But a coal mine cannot be made to reproduce the coal taken from it. An ore bank is exhausted when the ore is gone. Oil wells run dry. When lumber is cut it takes a lifetime to replace it. All these sources of wealth, while increasing in value, have been diminishing in quantity. Yet the anthracite coal unmined to-day has a higher market value than the larger quantity of unmined coal had ten years ago. The consumption of iron ore has increased until the United States consumes more than twice as much pig iron and almost three times as much steel a year as Great Britain. The supply of copper is being exhausted as rapidly as the great producing corporations are able to mine and smelt it.

All this means a great increase in the annual production of wealth, but does it in any way imply that the United States is growing richer? Wealth is not what is consumed, but what is available for future use. The coal that has been burned, the lumber that has been sawed up, the ore that has been smelted no longer exist for future production.

If the wealth of the United States has so enormously increased, in what concrete forms can this increase be found?

IV

Now there is no doubt that we are becoming richer. Some at least of these marked-up values are real. The values caused by social usage are the most genuine and permanent of all values, if we assume that organized society will continue.

Still, in a period of rapid "marking-up," let us beware of accepting all increases in value. It is a useful time for men who wish to do sound economic thinking to make discriminating judgments.

ABOUT THE POST-OFFICE DEPARTMENT

THE postal service of the United States is so badly managed that a Chicago man-of-affairs with good "backing" recently offered to conduct the whole business, to reduce the present postal rates on letters and periodicals by one-half, to extend the rural delivery system, and to pay to the Government all the net revenue over a dividend of 7 per cent. a year on the money that he would have to invest; and he would expect to make a good income. There is no doubt that any competent private organization could do all these things. The Canadian postal department carries periodicals for a certain distance at one-fourth our rate and at distances equal to ours at half our rate; and it has no deficit.

Nor is mismanagement all—perhaps not the worst—that can be said about the Post-Office Department. For it continuously puts out reports that are misleading and therefore untrue. For instance, the Government itself is, of course, the largest single user of the postal service. Every department of the Government uses the mail. Military equipment has been sent by post. Turnip seed is sent by post. Speeches which are campaign docu-

ments, and perhaps most of the product of the Government Printing Office are sent by post. There is an almost incalculable amount of this matter, and it goes post free. This may, or may not, be a proper method. That is not the point for the moment. The point is that, although this vast tonnage is carried free, the reports of the Department made to Congress year after year take no account of this vast free service and set forth a deficit in the postal revenues.

By any proper system of book-keeping, there would be no deficit in the postal revenues. But, even if there were a deficit, that would be no crime; for the service is for the benefit of the people and not primarily for profit. Nobody expects a profit from any other department of the government service—except, of course, the customs and internal revenue departments, which are tax-collectors.

There are, then, two distinct and serious shortcomings of the Department. It is ill-managed; and its reports to Congress (and, therefore to the people) produce a false impression—are essentially untrue.

II

But this is not all. Instead of an effort to improve this bad management, one department of the postal administration keeps up year after year an agitation for a change in postal rates—an agitation that is based on error, that misrepresents facts, that strikes at one of the primary purposes of cheap postage—the service of the people in supplying them with periodical literature—and threatens the whole vast industry of periodical publication.

In report after report, there comes from the Third Assistant Postmaster-General the untrue statement that a deficit is caused by the rate of one cent a pound on "second-class mail matter," which is periodical literature. This false impression goes into the report of the Postmaster-General; thence into his recommendations; thence (at times) into the President's Message; thence before Congress; thence before the Postal Committees; thence before a Commission appointed by Congress to recommend changes in the postal laws; thence into the public mind.

Now it has been proved over and over again, and as clearly as anything can be proved, that an increase in the rate on periodical literature would cause a lessened revenue to the Government and would diminish and to a degree destroy the periodical literature of the country. Still this agitation goes on year in and year out—starting always in the office of the Third Assistant Postmaster-General. The truth is that the rate of one cent a pound on periodicals brings a great revenue to the post-office by the correspondence that it causes. If the distribution of periodicals were restricted, the income from letter postage would fall off more than anybody can accurately calculate. For instance, one advertisement with a coupon (which they now propose to make illegal) in nine magazines some time ago brought 812,000 answers, each paying two cents postage and each causing the transmission of a package of merchandise through the mails on which a high rate of postage was paid; and the total of admittedly profitable postal revenue brought by this one advertisement was more than $24,000.

III

It is true that the Third Assistant Postmaster-General has a somewhat difficult task. He must exclude from the mails what may properly be regarded as fraudulent periodicals. But it was not meant that he should be a censor of periodical literature, with power practically to exclude what he pleases. Yet his rulings year after year, from which there is no practical appeal, become the law of the land as he interprets them—arbitrary ruling on arbitrary ruling till no man living knows what the postal law will be to-morrow.

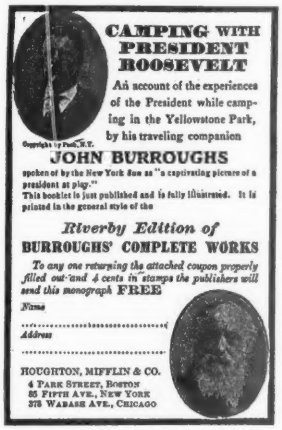
Worse yet, this autocratic office has for years been filled by a man who has a microscopic rather than an administrative mind—a man who has doubtless persuaded himself that he serves the Government in proportion to the trouble that he gives to the most important users of the postal service. He has become a tyrant, judge, jury, and hangman, all in one. He has for years kept the whole periodical publishing world bedeviled. He has presented the wrong issue to Congress and to the people. He proposes the wrong remedy for a misreported deficit, a remedy that would make a real deficit; he concentrates attention on one of the most beneficent uses of the postal service as if it were a fraud, and he thus distracts attention from the abuses that ought to be eradicated.

The first practical step, therefore, in reforming the postal service is to start about such a systematic study of the whole problem as will

disclose its real defects and to have it conducted, in all its branches of work, by men of constructive business ability. There doubtless are worse instances of maladministration than our Post-Office Department; but it would be hard to find them, even by those who favor the Governmental conduct of other kinds of business.

IV

Here is an example of Mr. Madden's silly method of making a "ruling" and then interpreting it as a law. Two months ago, this advertisement was published in THE WORLD'S WORK:


CAMPING WITH PRESIDENT ROOSEVELT
An account of the experiences of the President while camping in the Yellowstone Park, by his traveling companion
JOHN BURROUGHS
spoken of by the New York Sun as "a captivating picture of a president at play."
This booklet is just published and is fully illustrated. It is printed in the general style of the
Riverby Edition of
BURROUGHS' COMPLETE WORKS
To any one returning the attached coupon properly filled out and 4 cents in stamps the publishers will send this monograph FREE
Name
Address
HOUGHTON, MIFFLIN & CO.
4 PARK STREET, BOSTON
85 FIFTH AVE., NEW YORK
378 WABASH AVE., CHICAGO

This is the advertisement of a book written by a man of —well, surely of some degree of good repute in American literature—about a sportsman, surely also of some little note and also of some degree of good repute, and published by a firm with which the American people have had some grateful experience, and advertised in this magazine, which is at least meant to be a reputable publication.

Now, because the reader of this advertisement was asked by the advertiser to write his name on the advertisement and to tear it out and to send it to the publishers and receive Mr. Burroughs's essay on "Camping with President Roosevelt," Mr. Madden, the Third Assistant Postmaster-General, declared that the advertisement was not a proper advertisement, but a piece of writing paper inserted in the magazine; and that therefore the magazine was not a magazine entitled to admission to the mails at "second class" rates but that it ought to pay the much higher rate that is levied on "merchandise." He had as well have said that the paper on which it was printed was made of pulp and was therefore wood, and that the magazine must pay the postal rate charged for carrying lumber. After March 4th, his ruling is, no "coupon" advertisements will be permitted!

He made a similar complaint against an advertisement of—*The Youth's Companion!* A man had as well deny the respectability of Plymouth Rock or of Bunker Hill monument. An even sillier objection was made, by the help of the Attorney-General, to an advertisement of *Life*, which was inserted a few months ago in many of the best magazines.

Without humor, without youth or the memory of it, inappreciative of the literature of nature and of sport, even when the sportsman is a man of most excellent repute and of some public reputation, Mr. Madden piles up arbitrary "rulings" fold on fold, makes twist after twist in his ingenious foolishness, lays down whim on whim, all as law, mind you—solemn, fanatical, seeking martyrdom. And, if we have not all lost our sense of humor under his foolish annoyances, we ought to ridicule this conduct of the public business till it becomes impossible. Thus an ungeared piece of the machinery that we call Government goes creaking and lumbering on; and Congressional committees treat it seriously!

THE GOVERNMENT VS. THE STANDARD OIL COMPANY

THE United States Government has begun its long-expected suit against the Standard Oil Company of New Jersey, alleging the violation of the Sherman Anti-trust law; and it will try to prove that the Standard Oil Company is a conspiracy in restraint of trade. It is in many respects similar to the suit against the Northern Securities Company of New Jersey, which the Government won, and the merger was dissolved. Attorney-General Moody has explained at length the grounds upon which the Government will attempt to convict the Company, its subsidiaries, and the seven individuals responsible for its conduct, substantially as follows:

The suppression of competition in the production, the sale, and the transportation of oil, in order to obtain a monopoly.

The evasion of the decision of 1892 against the Standard Oil Company of Ohio, under which the trust was broken up, for it exists to-day practically as it did prior to that order of dissolution by the Ohio court.

The obtaining of rebates from railroads, and other unfair discriminations, whereby it has sought to monopolize the business and has been able to raise prices to the consumer in the territories in which it holds a practical monopoly.

The holding by its directors and officers of large blocks of stock in various railroads, and the obtaining by this means the sale of lubricating oils to railroads, as well as many other discriminations in favor of the Standard Oil Company.

This is a civil suit, not a criminal suit.

The accusation that will excite the liveliest popular interest, no doubt, is that in the territory where it has had a practical monopoly, the Company has charged high prices for oil. But it can probably never be accurately calculated whether or not the average price of refined oil has been raised or lowered by the operations of this trust; for no one can know just what the price might have been under other conditions.

If this suit be won, what will be the result? If no criminal actions follow, the practical result will be nothing. The court will order the dissolution of the holding company, that is all. The Company will, of course, comply. There the matter will end, as in the Northern Securities case, with the dissolution of the Company. No one pretends that the status of the Hill railroads has been changed by the ready compliance with the law. They are as much under the control and administration of Mr. Hill as they ever were. The form has been changed, but not the substance. So it will be with the Standard Oil Company, if the Government win its suit.

If the suit be lost on its merits as a claim and not through some legal technicality, the decision will be welcomed by corporations, but will probably raise much bitterness throughout the country at large. Such a decision would almost certainly increase the popular demand for more laws, and more drastic laws, for the regulation of corporations. The people have come to feel that perhaps the laws which protect the huge vested interests do not sufficiently protect the public through whose patronage the corporations exist. The suit is, in fact, a real test of the power of the law to control the tremendous corporate powers whose creation it has authorized and assisted.

More important even than a conviction may be the publicity that the trial will throw on the management of the Company. If it really have been guilty of the practices of which it has been accused, facts will be brought out during the trial to show its guilt. If no such facts are brought out, the Company will gain in the general esteem.

The Company has made two statements about the suit. In one its stockholders were assured that their interests will not suffer. The other statement was to the effect that the suit will injure our foreign trade. It is safe to say that no action at law in recent years has been watched as this will be.

AMERICAN SHIPS, IN ONE WAY OR ANOTHER

IT seems more and more likely that high protectionism will be hastened to its fall by subsidies to American ships; for, if we do develop a great commerce overseas in our own ships, the very momentum of it will sweep international obstructions out of the way, many high duties among them.

It is absurd and suicidal that, with products and wares to sell everywhere, with a growing demand for things from all other countries, and even with money to invest abroad, we must yet go to South America by way of England; and this at a time when practically all the South American states are showing the stability of their governments and are in a better attitude to us than ever before. We once had subsidized ships to Brazil and they failed. We once granted a subsidy to the Pacific Mail and reaped a scandal. But these were incidents of an earlier time and of different conditions. With the President's influence, with Secretary Root's argument, made when he was fresh from his conciliatory journey, with the changes in commercial routes that the Panama Canal is expected to bring, with our general outward-bound impulse, the old project of subsidies gets new influences in its favor. The bill, which passed the senate at the last session, may not pass the House. But the project does not die easily.

Nor has the feeling ever died in the American masses that we ought to be masters of the sea in a sense in which we are not now masters—that American ships, the American flag, American sailors ought to be seen in every port; and there is a strong sentimental appeal in any movement that promises such a revival.

But the proposal to grant subsidies in any form arouses fierce and determined opposition. It provokes, as it ought, a demand for the repeal of some of our absurd navigation and shipping laws. It arouses the opponents of protection and those who fear jobbery and scandal. But it must be confessed that it now has a new sort of impulse behind it. To have ships and to extend our trade—the feeling for these things is strong; and, if our great prosperity lasts much longer, this feeling will find gratification in one way, if not in another. We want a merchant marine so badly that we are willing to try to get it by almost any means. If the opponents of a subsidy wish to have their way,

they must make a stronger demand for free ships, or convince the public in some way that they can revive our shipping.

TWO COLOSSAL PLANS THWARTED

THE remark was dropped by Mr. J. J. Hill a little while ago that, just before the Northern Securities Company was dissolved, the management was offered to him of all the great Western railroads between the Canadian and the Mexican borders. These were to be merged into one great aggregation. It has come out that a similar merger was to be made of the principal Southern roads. These plans stir the imagination; for, if they had been carried out, a long step would have been taken toward the possible ultimate consolidation of all the great railroad systems.

Such an event has been often predicted, of course. You will find men who will say that it is necessary as a practical measure in order to secure perfect coöperation and to prevent the waste of competition. You will find other men, of course, who would regard such an event as the consummation of our servitude, the only escape from which would be governmental ownership.

For the present, the subject has a remoter interest than it had a year or two ago; for further formal consolidation of competing systems is now forbidden. But the pressure of economic forces in the long run proves stronger than forbidding statutes; and, if it be really true that continuous consolidation means greater efficiency, it will go on in some form until an even smaller group of men become our masters of transportation than the little group that now holds control. But it would not necessarily follow that they would do our liberties greater hurt than the railroad kings of the past have done them. For governmental regulation, state and national, is increasing at a more rapid pace than the centralization of power. If we produce men of genius for consolidation, we produce men also of genius for regulation; and events seem to prove that the voice of the people may after all reach even magnates and monopolists. At any rate, there is yet no reason why any man should despair. Among other facts worth remembering is the fact that Mr. Hill declined; and perhaps there is not another man living to whose experience and judgment such a colossal consolidation would be willing to entrust itself.

GLIMPSES OF NOTEWORTHY MEN

A GOOD deal of gossip, certainly not authorized and probably irresponsible, continues to find its way into the newspapers, touching the possible entrance into high politics of President Woodrow Wilson, of Princeton University, in New Jersey. First, he was suggested as a Democratic candidate for the United States Senate, and later as a possible Presidential candidate—as an antidote proposed to the party for both Bryanism and Hearstism.

The suggestion will hardly bear fruit, it is feared; for President Wilson is not a politician and he is a right-minded man of a safe and conservative political faith. He would not have the Government own the railroads; he would not stir up discontent; he has no fortune; he does not speak the language either of Utopia or of riot. But, if the Democratic party should come to its senses again next year and assert its old doctrines and take on its old dignity, and seek real leadership (and pray Heaven, it may!), leaving its Bryans and its Hearsts alone, this suggestion of President Wilson is logical, sound, dignified, and decent.

Here is a man of high character, and of the best political ideals, a man who knows our history, our laws, and the genius of our people, American to the core and linked by inheritance and by training to the best traditions of the past, a man who has had such executive experience as a University presidency demands (and that is a good deal), a man of a wide acquaintance, and of a mind of his own. He comes of a Southern family—was reared and chiefly educated in the South—but has lived the wider life of a citizen of the Republic. His venerated father was as staunch and beautiful a character as ever adorned and made strong the Presbyterian pulpit. Although his life has been spent in academic pursuits, he is a man of a practical mind and he knows men as well as books. He uses our language with both strength and charm; he has a sense of humor; and he is a Democrat of the best traditions. What if a political miracle should happen and the long-lost old party should find itself by nominating such a man?

II

Mr. Cortelyou now takes up the Treasury portfolio, having served successively as Secretary of Commerce and Labor and as Postmaster-General. What qualities best fit a man for

Cabinet work? It does not seem to be necessary that he should be a master of his Department; for it is the habit of Presidents, especially of President Roosevelt, to shift his advisers often from one post to another. It would require a man a lifetime to become thoroughly familiar with any one of these great Departments. The qualities that count for most seem to be a general executive ability and a personality that fits into the Cabinet group and that has the President's confidence—good all-around adaptability and sound judgment.

The country has respect for Mr. Cortelyou, partly by reason of and partly in spite of his service as campaign manager-general; but the public has never quite got a clear understanding of his positive qualities, if he has them, as he must have; and there is some wonder—not exactly doubt, but wonder—how he will "measure up to" the difficult duties of the head of the Treasury Department. Silent, prudent, but always non-committal, courteous but quiet to a fault—who really knows Mr. Cortelyou or knows what he thinks? He is the most striking example that you will find of a man who has risen from sheer routine by winning the confidence of his superiors and by keeping the silent and prudent habits of the private secretary.

III

If you live in Minnesota, you already know Governor John A. Johnson. If you live somewhere else and go to St. Paul and visit the magnificent new capitol, you may, if you like, walk into the Governor's office and make his acquaintance. The tall, homely, good-natured, busy man of infinite leisure and with a genius for making acquaintances will talk to you as freely as if you had known him while he was the editor of a country paper, or even earlier, during the period of his struggling boyhood on a farm. Governor Johnson is a Democrat who was elected in 1904 when President Roosevelt carried the state by a plurality of more than 146,000; and he was elected again last year by more than 60,000 when again all the other state officers elected were Republicans.

His success has been won (so some persons will tell you) because of the wretched mess that his political opponents made of the administration of public affairs in Minnesota. Others will tell you that he owes his political strength to the Scandinavians, for his father was a Scandinavian immigrant. All this is true—to a degree. But the larger truth is, he owes his success to himself, his personality, his clean and sincere and direct way of conducting campaigns and of conducting the public business. The people feel that he is *their* Governor, not a party's Governor, nor the Governor of any interests or clique. He is a political success because he is, in a sense, not a political person at all—not a "professional" in manner or in fact—but a straightforward, plain, strong, kindly, direct representative of the high-average honest man—another proof that men now count far more than parties in our public life.

IV

Mr. James Ford Rhodes has finished his History of the United States from the slavery compromise of 1850 to the end of Reconstruction in the South; and these seven volumes are a monument of industry and (rarer yet) of fair judgment.

Mr. Rhodes began life as a man-of-affairs. Born to an industrial career in Cleveland, where he would have become a man of very great fortune, he turned his whole life, when he had made a competence, to this historical task. He became a citizen of Cambridge, Mass., then of Boston, the better to apply himself without interruption to historical research and writing. His historical writing, therefore, has not been done during the leisure got from teaching nor from labor of any other sort, but as the sole business of his life; and surely history ought to be so studied and written. This undivided devotion has had much to do with the fact that, along with Mr. Fiske's volumes about earlier periods, Mr. Rhodes's is the most noteworthy American historical narrative of our time. It is one man's work, and it, therefore, has continuity and unity, and is not a part of any cooperative series of books such as are making this generation regard our history as a dull succession of facts. The reader of such series must make his journey by changing horses at every cross-road.

If it be fair to judge by the laborious results of much of our academic historical writing, it was a distinct advantage that Mr. Rhodes had his early training in an orderly business pursuit rather than in a university. He learned in business to make good judgments of living men, and he has, therefore, the better made

just judgments of men in a turbulent era of the past.

He has finished this large task early enough in life to take up another, if he have a mind to, or early enough to enjoy for many years his fame and his friends of both continents; for his chief recreation has been his hospitality and he has won the companionship of many of the most interesting men in the world.

A DEEP MIDCONTINENTAL WATERWAY

A DEEP waterway up and down the Mississippi Valley is a corollary of the Panama Canal. It is a necessity, too, because of the rapidly growing volume of traffic, of the insufficiency of railroads, and of their higher rates, and because of the generally increasing pressure of population and of products to reach the sea by the easiest route.

The subject is agitated every year, and every year with increasing force, at great meetings of commercial men in the Middle West; and any man who can read the future knows that this great project will at some time be carried out. The last discussion of it received the momentum of Mr. J. J. Hill's and Secretary Root's approval.

One of the most important facts in the world, which those who think along coast-lines easily forget, is the internal commerce of the United States. Our great contiguous area of free trade, of cheap transportation and quick travel, of practically instantaneous communication, and of a homogeneous population, self-maintaining by the great variety of production —this is the area of the most important and successful interchange of wares (and of ideas, as well) that has ever existed; and whatever can make travel or traffic better will in time be done. This era of prosperity is likely to become a great constructive era of practical improvements, of use for all time to come.

A DEPARTMENT OF HEALTH—AND OF ENGLISH

THERE goes on forever an extension of governmental functions that is disquieting to old-fashioned thought. But it must be so, because new duties arise that can be done by no other agency, or at least that will not be done by any other. Among such new duties is the work that the National Government might do to preserve the public health—not only to prevent the importation of diseases but to prevent diseases that we already have. There has long been an agitation for the creation of a Department of Health, and it is an agitation that will win at some time.

The task of putting into effect the preventive measures against disease that have been indisputably proved effective is a hard one. Yet, if it could be done, the saving of life and the saving of wasted effort, time, and expense would put working society on a wholly different basis from the ailing, wrongly fed, bad-breathing, quack-ridden, disease-transmitting kind of existence that we now lead. There is no other field for human progress so plain.

The Government, by a Department equipped and managed with directness and common sense, could do much; for it would (or ought to) work unhindered by the unfortunate traditions, surroundings, and jargon of medical men, and even of their organizations and other academic societies. For instance, a public-spirited appeal is made to the press of the United States by the "Department of Social Sciences" of one of our foremost universities, which contains these paragraphs and these violences of typography, and this misspelled Latin: and misquoted Scripture:

> "The fearful wastes of death and sickness and the dreadful havoc wrought can never be described. The fiercest battles ever fought left no such bloody trails, even when the mailed hand of war smote cruelest and harshest, as the crimson boulevards—*ten-death-chariots-wide*—traced by the passing finger touches of pneumonia or consumption wastes within a week's end span. Along these ghastly boulevards will be strewn, before twelve months are gone more blasted hopes and broken hearts than all the countless grinning skulls slain in fair fights and whitening battlefields since time began.
>
> "**Could the 750,000 persons in the United States marked for death during the next twelve months from preventable causes** voice in a *threniad* verdict *their* conviction, in a last solemn *morituri salutamus*, who can doubt what would be their admonition: *that good health is more precious than rubies, and a long life well lived fairer than beaten gold.* Who can doubt, if these measures were before the nation, how *they* would cast *their* verdicts? As the slaves chained to the chairs of the conquerors in the triumphs that are gone, so the passing hours silently remind us: 'And we too are mortal.'"

This is put forth from one of our principal universities as a plea to the people for a National Department of Health. It is the sort of talk and type that drives men to socialism and to patent medicines and to faith cures, and not the sort of talk or type that cleans out a single well that contains typhoid germs or kills a single malaria-bearing mosquito. To teach our professional masters the English tongue—

that would be one long step toward the eradication of disease. The unintelligible language of medicine and of the "social sciences" is responsible for slaughter "ten-death-chariots-wide"; for it prevents men from finding out many simple facts that would save them. Yet this fence of language between the men who would save life and the lives that would be saved remains, as a vigorous farmer once described his fence—"horse-high, pig-tight, bull-strong"; and every generation and institution of "learning" perpetuates it.

SKILLED WORKERS AND SOCIAL SENSE

IN EVERY part of the country there is a loud demand for skilled laborers. Masters of any of the trades command good wages, and they are too few everywhere. This demand is stimulating talk of trade schools in every section of the country, and the formation of organizations to promote them. The state of Massachusetts has a commission to study the subject and to recommend a remedy, and there is a national society to promote the training of mechanics. A new trade school of wide scope has recently been established at Indianapolis.

Why there should be fewer journeymen in proportion to the needs and opportunities of our life apparently than ever before, is an easier question to ask than to answer. Of course, the old apprentice system, by which many boys were once trained, has gone out of use, and the labor unions do not encourage or permit as many beginners as a generous and far-sighted policy would suggest. Moreover, they put a premium on mediocrity, and hold the best to the level of the average. But these facts explain only a part of the dearth of skilled workers with their hands. The public school system, much as we have talked about "industrial education," does not lead toward mechanical training. Yet there are other reasons than these why there is a dearth of carpenters, masons, machinists, and the like almost everywhere.

Doubtless, the strongest reason of all is social. In spite of the chance for good wages and opportunities for fortune and great usefulness that mechanical careers offer to the capable, there has grown up a feeling, since the rush to the cities began, that there is a social disadvantage in mechanical work; and this feeling when persisted in, of course, becomes a fact.

A poor lawyer, a clerk, a salesman—a well-dressed townman of almost any calling—imagines himself superior in dignity and standing to a man who works with soiled hands. This very un-American notion has taken a strong hold on the last generation or two, who have come into their working period since our great commercial era began.

Those who are concerned to educate American youth after the proper American fashion may get from this social absurdity a good hint of one direction in which much of our so-called educational energy has been misspent. The trouble can be reached and cured only by a better-balanced social judgment, a truer measure of men, a standard more like the standard of an earlier and simpler period of our history.

THE STATISTICAL HABIT

IT is a social item that has much currency that we imported last year more than one hundred million dollars' worth of luxuries, such as precious stones (forty millions), laces and the like (forty millions more), feathers and such gewgaws (seven millions), champagne (six millions), cigars (many millions more); and so on.

This is a great economic waste, no doubt, and we are developing useless and even harmful habits for a simple people in this period of great prosperity. But these enormous totals thus summed up and set forth by the Department of Commerce and Labor ought not unduly to frighten us. A hundred million dollars are only about a dollar and a quarter for every one of us, and there's hardly a clodhopper on any of our hills who doesn't chew more than a dollar and a quarter's worth of tobacco a year; and many a poor man drinks liquor enough in a week to cost much more. Heaven forbid the defence of either diamonds or grog; but Heaven forbid also that the statisticians should scare us to death with their totals about our extravagance. Unrestrained indulgence in statistics is a worse habit than either diamonds or beer.

MAKING TRAVEL SAFER

THE recent tragic death of Mr. Samuel Spencer, President of the Southern Railway, in a preventable rear-end collision on his own road, emphasizes the wrong method of railroad conduct—the giving of more attention to policy and finance than to the actual operation of a road. That great railroad system is a wonderful triumph of consolidation

and extension and of financiering; but the running of its trains almost always behind time and the frequency of accidents have for many years been too great. Of course, the road has been overworked by the magical increase of travel and traffic in the South; but its operation also has been undisciplined and bad.

A noteworthy fact of that sad accident was the wrecking of a day coach which was the fourth car from the rear of the train where the collision occurred, although Pullman cars between it and the rear escaped destruction. This day coach was "of lighter construction."

In the best railroad practice, we are about to make another long stride in safety. For instance, a number of devices have already been put in use on the New York subway and the Boston elevated road, which will automatically stop a train before it can pass a signal set against it. Since these devices are accessible, it is inexcusable that two trains should collide in a block, or that any railroad should maintain the savage derailment device which plunges a whole train of passengers off the track as the penalty for the neglect of a careless engineer.

The new safety system to be employed on the electrified zone of the New York Central marks the greatest advance that has been made in signal systems. All the signals will be operated by electricity and the lights supplied from the power-house. For trains running forty-five miles an hour, the blocks are 1,200 feet long; between forty-five and sixty miles an hour 2,500 feet long; and sixty miles an hour 3,000 feet long. Electric lights will be used. Automatic stops are provided to operate whenever a signal stands at "danger." On the New York, New Haven, and Hartford and the other electrified lines entering New York City, automatic devices will be used. The lines will be made as safe from collisions as all the machinery that human ingenuity has thus far created can make them.

Steel cars, both freight and passenger, are being adopted more and more widely. Side-entrance steel cars were used on the Illinois Central Railroad in 1904 even before a few were used in the New York subway. Steel postal cars have been introduced on the Erie Railroad, the Santa Fé, the Harriman lines, and many other roads. The Interborough Company, which operates the New York subway, has been severely criticized for not having all its cars of steel, for all the railroads entering New York which are now being electrified have ordered steel cars for their new equipment. The Southern Pacific Railroad and the Southern Railway itself have even built some ordinary passenger cars of steel. The new cars of the Philadelphia subway and elevated service are of steel, and the street cars of San Francisco and other places are made with steel frames. The awful fatality of railroad wrecks will be greatly reduced when the use of automatic safety devices and steel cars becomes general.

THE CENTENARY OF GENERAL LEE

JANUARY 19th is the one-hundredth anniversary of the birth of General Robert E. Lee. He was the most heroic figure of the Southern Confederacy and the only Southern man brought into prominence by the Civil War whose character has taken a permanent hold on the imagination and the admiration of the whole nation. There were other Confederate soldiers whose achievements won them military fame—"Stonewall" Jackson to a preëminent degree. But it is not only as a soldier that General Lee won a secure place in American history, nor perhaps chiefly as a soldier.

There will, perhaps, forever be dispute whether he did right to resign from the United States army and take up arms against the Union; but no disputant now doubts his sincerity. It is difficult for this generation to understand the attitude of men in 1860 toward the States. In the minds of one great party, a man's state stood as first claimant on his loyalty, the United States next. It was in this school that General Lee was reared, as most other Virginians were. In a sense, he had no sympathy with the Confederate movement. He was not an original "Secessionist." He knew at an early time, if not from the beginning, that the Union armies would win. His desperate fighting was of battles that he knew would at last end in defeat. But he regarded his duty to his state—his duty to Virginia—as his first duty; and in obedience to this he sacrificed a career that might have made him the principal military figure of the Union cause.

Whatever difference of opinion men may hold about his decision, there has come since his death a settled judgment of him as a man. His conduct after defeat—his dignified and sincere acceptance of the result, his abstention from politics, his refusal to degrade his name

and fame for commercial profit, his giving his closing years to the training of youth, the high mind and dignity of the man shown by his bearing and conduct and revealed in his familiar letters—these things have peculiarly endeared him to the Southern people and made him the type, to all the world, of the best that Southern life produced. The very general celebration of the centenary of his birth is a fit acknowledgment of the force of great nobility of character.

THE EARNINGS OF LIFE INSURANCE AGENTS

AN INQUIRY comes to THE WORLD'S WORK whether the earnings of life-insurance agents are likely again to be as large as they formerly were.

No. In the first place, so far as the New York companies are concerned, the amended law forbids the payment of commissions to agents on the former very generous basis. Under the old system the agents were paid in proportion to the yearly premium. Under the new law, their commissions are a percentage of the face of the policy. For this reason, those kinds of policies which yielded the largest commissions—the various forms of endowment policies with their high yearly premiums—are not likely at any early time, if ever again, to enjoy their old forced popularity.

The insurance agent of the future will have the insured man for his client, rather than the insurance company; and, while he will have an opportunity to earn a fair income, he will hardly make a large fortune, as many a one did during the period of the popularity of endowment insurance. The business will be more reputable and less lucrative.

THE TELEPHONE A NATIONAL HABIT

THE history of the telephone in the United States points plainly to the fact that our people put a higher value on their time and convenience than any other people in the world. When the Bell patents expired, telephone companies were organized all over the country.

These independent companies competed with the Bell system in many cities, and supplied service to towns which had had no telephone at all before. They were responsible for the introduction of the automatic central, or, as they call it, the " cussless, waitless, out-of-order-less, girl-less telephone." Companies of farmers and ranchmen strung wires to keep themselves in touch with each other and the world, sometimes running them along fences. And all this went on while the Bell system was doubling the number of its patrons every few years. The number of telephones continues to increase.

It is becoming almost a national characteristic to have one. And a significant fact is that this is not a contest between the Bell and the independent interests but that the American people have been keen enough to recognize, as no other people have, the social and economic power of the telephone and to demand its universal introduction.

THE PRESIDENT AND THE CANAL

YOU doubtless read in your newspaper something like this when President Roosevelt came home from Panama: "There was a feeling of relief when he reached Washington in safety." Yet you cannot point out any danger that Mr. Roosevelt encountered on that journey one whit greater than the dangers that surround him every day in Washington; and a warship is safer than a railroad train, and Panama than a hundred crowded American cities that he has visited.

It was a very sensible thing to do—for the President to go and inspect with his own eyes the most important physical work that the Government is doing during his administration. His presence gave a stimulus to the men who are doing the job and his visit gave authority and earnestness to whatever he has said and may hereafter say about it.

He has regarded the great undertaking with the utmost seriousness and made the supervision of it as nearly his personal work as possible.

The President has also concentrated responsibility by making Mr. Shonts the head of all the work and by giving the heads of departments under him the greatest power possible. This means in effect the taking of the task out of the hands of a large commission—a change that Mr. Roosevelt wished long ago to make in form as well as in effect, but which Congress did not then assent to. By going to the Isthmus, Mr. Roosevelt did an unprecedented thing, but the Canal itself is an unprecedented thing; and the people have the greater confidence in the prosecution of the work because of his direct personal interest in it. But there is no denying the prodigious difficulties, the enormous cost, and the long time that will be required to complete it. The people will have to use a long patience before ships ever go through it.

THE INNOCENT INVESTOR AND THE MINING BOOM

DURING the last few months there has been a new outbreak of the craze for mining stocks. On the "curb" market in New York, on the markets of Toronto, Denver, San Francisco, Goldfield, Nev., and several other centres, there has been wild speculation in these stocks; new high prices have been made for many of the securities that have been in existence for some time, and hundreds of new stocks have come to light to cater to the extraordinary demand of the people for mining stocks.

The WORLD'S WORK has been beset with queries from investors, asking for advice with regard to the purchase of these stocks. To one and all, the reply has been that the small investor should by no means purchase mining stocks. These stocks are to be regarded as utterly unfit for the investment of savings. We shall make no exception to this statement. It applies with almost as vital significance to the stocks of the Anaconda, Calumet & Hecla, and Amalgamated Copper as to the thousand new, glittering, alluring prospects that parade themselves day by day in the advertising columns of the press.

This judgment will stand until such time as the mining industry puts off forever the "wildcat" character under which it lives at present and has lived in this country since its beginning. That there are good mines, no one can deny. That there are golden fortunes to be gathered from the purchase of mining stocks at present, is extremely probable. The investor must forget this, and must shun the chance for such fortune for the reason that less than one per cent. of the so-called mines which parade themselves in the public prints will ever return one cent of the money put into them, let alone pay dividends to their stockholders.

On this point there is abundance of testimony. In a recent editorial the *Wall Street Journal* said:

"Eighteen new mining stocks appeared on the "curb" one day this week. The par value of the mining stocks authorized in the United States and Canada this year has been estimated as high as $900,000,000. Inasmuch as the vast majority of these mining propositions are mere prospects, at the best exploration schemes, the character of this speculation is disclosed. It would be remarkable indeed if 5 per cent. of these stocks should turn out paying investments.

"A high-class mining engineer said three years ago to the writer: 'There are just two classes of persons who are entitled to enter into mining enterprises: (1) The practical miner who makes mining his life business; and (2) The rich capitalist who can afford to take extraordinary risks. For everybody else, mining is a perilous gamble.' "

Almost at the same time, Mr. Daniel Guggenheim, president of the American Smelting & Refining Company, made this remarkable statement:

"Even where there are undoubtedly surface indications of ore values, it should be borne in mind that 1 in 300 is a conservative estimate of the proportion of prospects that eventually fulfill their promise. The two hundred and ninety-nine failures are forgotten in the one success, and that one is made the bait with which the public is tempted to three hundred more ventures."

It is as well to state categorically the reasons why the public, or at any rate that part of the public which has only small savings to invest, should not under any circumstances purchase mining stocks. These reasons follow:

(1) Out of every hundred mining stocks that are advertised for sale, not more than five represent mines which are actually producing gold, silver, or copper; and out of these five, not more than one or two will ever produce enough to pay dividends on stocks or give any permanent value to those stocks.

(2) The laws of the states in which 99 per cent. of these companies operate are not sufficiently strict against actual fraud, against the issue of stocks on alleged mines which do not exist at all. Hundreds of stocks are created every year, and sold as mining stocks, with no mining property behind them at all.

(3) In ninety-nine cases out of a hundred, these stocks must be bought almost entirely on the "say-so" of promoters themselves interested in the stock, and without the chance of an actual personal investigation of the property

represented. Even if such examination be possible, the non-expert can learn nothing whatever from the investigation of a mining claim, or even an open mine.

(4) When mining stock booms occur, they are inevitably led by new stocks. The small stocks which you bought in the boom of 1900 were hardly heard of in the boom of 1906. The "popular" list of 1900 on the Colorado Springs Exchange is now showing prices from 50 per cent. to 99 per cent. lower than in 1900.

(5) The whole business of promoting mining stocks is on a moral plane extremely low. The old adage that a Western mine is "a hole in the ground with a liar at the top" holds good in a remarkably large proportion of cases.

(6) Emotion plays too large a part in the business of mining stocks. Enthusiasm, lust for gain, gullibility are the real bases of this trading. The sober common-sense of the intelligent business man has no part in such investment.

(7) If you buy a prospect which turns out well, the chances are still against your ever enjoying the fruit of this success. In a large majority of cases, the people whose money first opened up the great successful mines of Montana, Arizona, Colorado, and Rossland were "shaken out" as soon as possible after the promoters of the mines discovered that the mines were really rich in copper, gold, or silver. You, as a small stockholder, cannot know whether the mine be successful except as the officers are willing to tell you. In three cases out of four they will not tell you of success until they have "gathered in" as much of the stocks as they can induce you to sell.

(8) The information contained in the prospectus of a mining company is generally all the information you will ever get. Out of a list of ten stocks largely advertised for sale in one New York daily paper in the boom of 1900, it is now impossible to find a trace of eight stocks. One of the others is listed as a "fake." The stock of the tenth is selling at two cents per share. It was sold to the public in 1900 at a dollar.

These reasons are the result of a careful study of this business as carried on in Wall Street during the last five years. The first of them is said to be recognized by mining men as one of the cardinal truths of the business. It arises out of the very nature of the mining industry. Out of every five mines that start from the surface rich in gold, silver, or copper, four will disappear before ore in paying quantity is produced.

At a recent mining conference in Colorado, Governor Pardee, of California, framed a law which should go on the statute books of every state. It makes it a felony to publish in a book, prospectus, notice, or report any statement false or wilfully exaggerated and tending to give a false value to properties or securities. Such a law is very badly needed. The honest leaders of the mining properties in Colorado and California endorsed the belief of Governor Pardee that the business of mining is debauched and degraded by the fraudulent practices of the unprincipled promoters, and endorsed this intended law. Until it is in existence, the mining business will continue to be permeated with fraud.

The third reason is clear enough. As to the value of a non-expert examination of a mine, it is perhaps enough to point out that hundreds of millions of dollars of English money were tempted into Colorado mines not so many years ago by inviting examination. When the examining "experts" arrived, the mines were "salted" for their inspection with ore obtained from other mines. On their favorable reports their clients invested heavily. If even the most competent expert can be fooled so simply, of what value is the layman's examination? All that can be seen in the case of a "prospect" is the surface. The odds, as pointed out above, are at least four to one against even the real expert correctly reading the surface indications.

A lesser danger, of the same character, is the matter of title. Only a month or so ago, the Guggenheims of New York, probably the most deeply experienced mining firm in the United States, took an option on a large amount of the stock of the Nipissing mines at $25 per share. They had sent their expert, Mr. John Hays Hammond, to that region to report, and on his report had taken this option and put up about $1,750,000 for the first installment of the price. A couple of weeks later, questions arose as to the title covering the property. The Guggenheims asked thirty days in which to investigate. The sellers refused. The New York firm thereupon sacrificed the $1,750,000, and refused to make a second payment. The stock of the Nipissing Company collapsed from $33 per share to $15 and lower. If the Guggenheims can be caught this way, what chance has the average outsider?

On the fourth reason, the following list of

stocks is taken from the New York *Herald* quotations of November, 1900, to show that the boom of 1906 has not brought back the faded fortunes of those who bought Colorado stocks in 1900. Similar lists can be obtained covering other markets for the same period:

	1900	1906
Elkton	190	53
Jackpot	58	05
Pinnacle	20	02
Portland	336	190
N. Haven	10	02½
Acacia	42	09⅜
C. C. & M.	12½	02½
Isabella	72	24
Golden Age	03	00½
Work	27	22½
Findley	16½	79½

This list is partial, but it contains all of the 1900 list for which ready comparison is obtainable. Some of the 1900 stocks have been "consolidated," some have disappeared from trading, others have dropped entirely out of sight. It may also be interesting to note that in the boom of 1900 Mr. Thomas W. Lawson, of Boston, gave the public a rare chance to buy Trinity Copper at $25 per share. It is now quoted around $11.

The reason for this seems to be that when a mining boom springs up it is generally based upon discoveries of metal in some new region. The boom of 1906 follows the discovery of gold in Nevada and silver and cobalt at Cobalt, Ontario. The 1900 boom was probably started from the Rossland excitement, more than anything else. Le Roi stock, representing a gold mine in Rossland, sold at $50. People have since been glad to get a few cents for it.

The seventh reason should be carefully borne in mind at all times. To illustrate it, the history of Amalgamated Copper since 1900 will do as well as anything. The wild enthusiasm of the subscription, the 8 per cent. dividends following that public participation, were in turn followed by a long period of decline which "shook out" the public stock at prices from $10 to $60 below the first subscription price. The "inside interests" bought huge amounts of the stock at low prices. Then came recovery, until at last the old 8 per cent. dividends were resumed, and the stock sold higher than ever before.

Of course, the decline and the rally are to be ascribed to natural causes, the former to the decline in the prices of copper—the metal—and the latter to the swift rise in that price, coupled with wonderful new discoveries in the Anaconda mine. Even so, the result is the same.

There is no real publicity in mining literature. Annual reports are extremely rare. Perhaps a dozen companies can be named, out of thousands, which give to the stockholders even a pretense at such reports. The alleged statements that have come from the Amalgamated Copper Company, the Anaconda, the Greene Consolidated, and others do not give to the analyst enough information to form an intelligent opinion. Of its very nature, the mining industry cannot be outlined in reports. The future is too intangible. The reports can barely outline the past and hope for the future.

This subject can hardly be dropped without a passing reference to the hundreds of "Dogs," "Queens," "Coins," "Crowns" and other peculiar things that are advertising themselves in the Sunday papers, the cheap magazines, the mining sheets, and by millions of circulars sent out "on the odd chance" to the public. If they are copper prospects, they are free to confess themselves "another United Verde," or "another Calumet & Hecla." If gold or silver risks, they parade their chances of becoming another Tonopah, or, just now, another Nipissing. They tell you that their property is "on the same vein" with the United Verde, the Tonopah, or the Nipissing.

Avoid them. In nine cases out of ten they are the merest prospects, gambles of the most insidious kind.

If you are tempted to indulge in the luxury of fliers in these stocks, buy a copy of one of the Denver mining papers. Read it through as a matter of curiosity. Then turn back to the editorial page. In the November issue of the *Financial Bulletin*, of Denver, is a list of companies about which the editor is asked to make reports. The list contains 118 names. The letters that asked about these concerns were so many "agony calls," representing in many cases the tears of those who had "invested" their money in the stocks of the companies listed. Such letters come in thousands to the editor of every financial publication every year. From experience, we can say that in over 90 per cent of the replies concerning the stocks of small companies the anxious inquirer is told that the stock is "worthless," or that the company "cannot be found."

TRAVEL BY SEA

THE NEW TRIUMPHS IN OCEAN TRAFFIC

BY

LAWRENCE PERRY

THE American-built steamship *Savannah* came up over the horizon veiled in the reek of burning coal and pitch pine. Through it her sails, yellow, distorted, seemed unlike anything that ever drove ship. The lookouts at the mastheads of several three-decked men-of-war and stately merchant craft cruising off the coast of England that morning in June, 1819, sent the dread cry "fire!" rattling down to the decks; with one accord, yards were jammed about and merchantman and ship-of-the-line alike sped to the rescue. When they came up with the *Savannah*, she merely signalled her thanks, adding that she was not on fire, and proceeded calmly on her way into Liverpool.

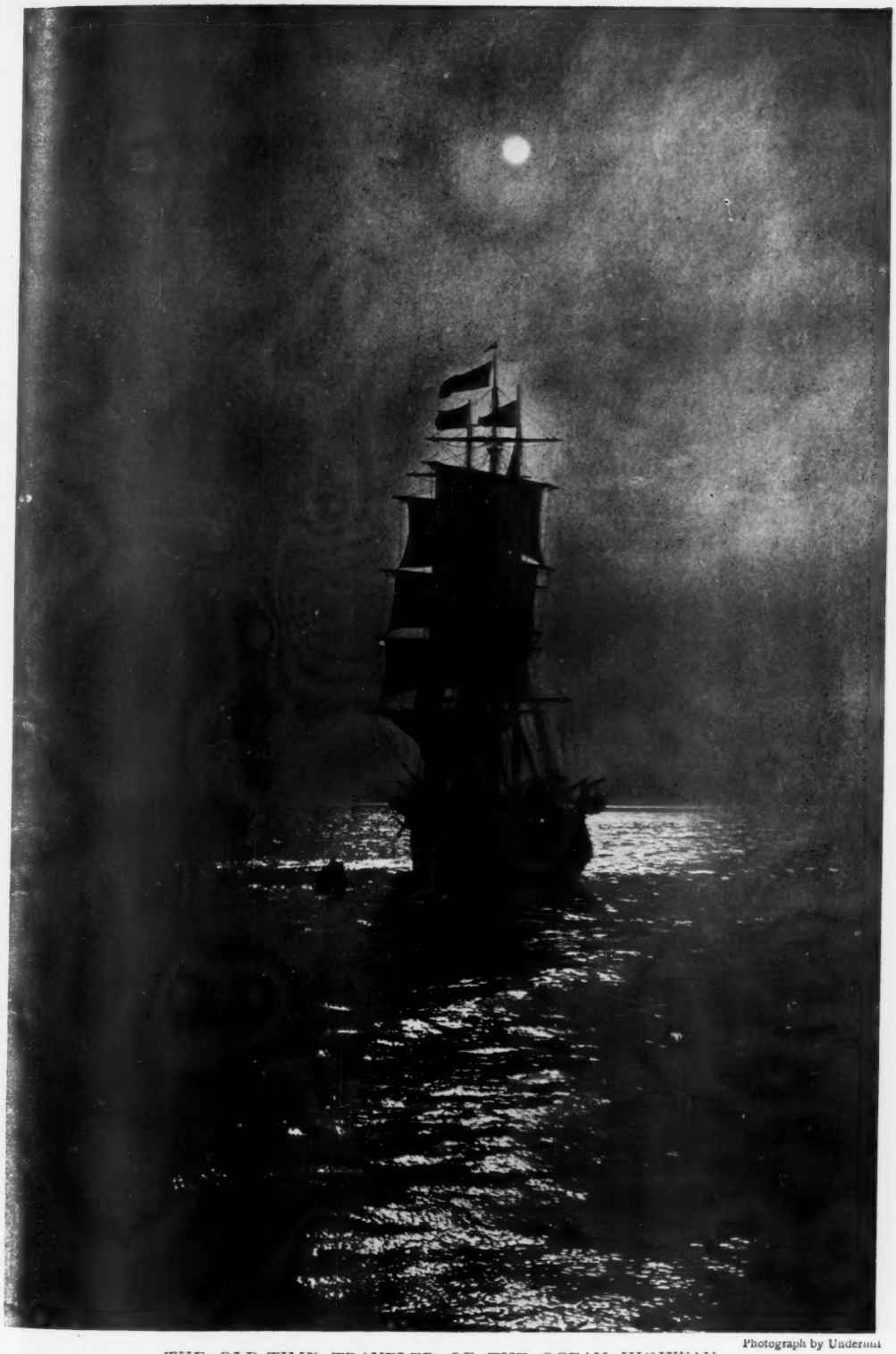
This was the first craft propelled by steam that had ever crossed the Atlantic, or any other ocean. Steaming from the city whence she derived her name, on May 26th, she made the passage to Liverpool in twenty-five days, utilizing steam power on all but seven of those days. She registered 320 tons, and her motive power was iron paddle-wheels driven by engines of 72 horse-power. She utilized in her passage 1,500 bushels of coal. The *Savannah* went to St. Petersburg and ultimately recrossed the Atlantic, arriving in New York harbor in some twenty-odd days. But she never crossed the deep seas again, and for twenty years sail continued to reign supreme. Then, in 1840, the Cunard steamship *Britannia* began regular transatlantic trips. She registered 1,154 tons, with a horse-power of 750 and a speed of 8 1-2 knots an hour.

To-day, sixty-six years since the *Britannia* ruled the deep, vessels propelled, not by flapping paddle-wheels, but by twin screws, which have crossed the Atlantic in six days and less, vessels capable of from twenty to twenty-three knots an hour, registering from 10,000 to 25,000 tons and with engines generating from 10,000 to 40,000 horse-power, arrive in the port of New York almost every day. Next summer will arrive in that port two liners 790 feet long, of 45,000 tons gross, with turbine engines generating 70,000 horse-power, driving the vessels through the water at an hourly speed of twenty-five knots, thus bringing to realization that dream of shipping men, speculative mechanics, and theoretical engineers—the four-and-a-half-day boat—the Cunarders *Lusitania* and *Mauretania*.

Year by year, the ports of the seven seas have been drawn together, as surely as though some mighty natural force had diminished the waters, pushing forward the shores. In 1840, even in 1870, the recognized lanes of ocean travel were few indeed, communication with remote ports being dependent upon small, irregular vessels of low power—low even for those days—and upon tall clipper ships. To-day the world is girdled with lines, the craft of which make their calls as regularly, year in and year out, as the ferryboats that ply from New York to Jersey City.

No port worthy of the name anywhere in the world is now isolated. North, east, south, and west, from New York to anywhere, the liners come and go: great floating hotels; hulking cargo boats that could carry the products of a Central American republic; daring tramp steamships; sturdy coastwise liners and sailing vessels; all play their part, and play it well. Far-flung, the navies of great nations enforce the will of those nations: battleships which exhaust the imagination in point of mere potential dynamics; torpedo boats containing within their slim black hulls destructive forces that appall the mind, and speed not mean compared with that of a limited train; submarine craft, and greyhound cruisers.

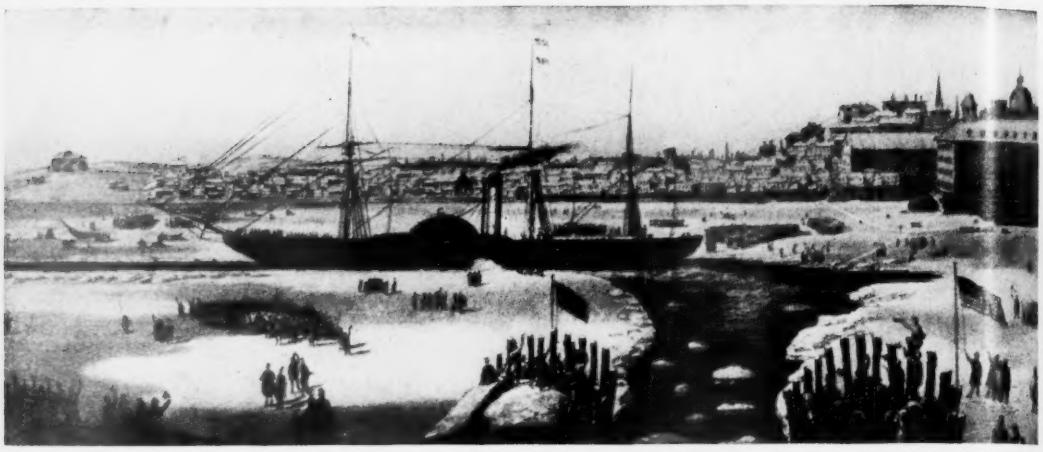
Consider that in the 'fifties the only great lines crossing the ocean were the Cunard and Collins and the Hamburg-American lines, with, say, eight first-class liners between the two. What have we to-day? Speaking offhand, the White Star line, with thirty-one



Photograph by Underwood

THE OLD-TIME TRAVELER OF THE OCEAN HIGHWAY

The sailing ships that furnished artists and poets with inspiration. Old romance about them has disappeared
(This photograph was taken at mid-day with the camera pointing directly toward the sun)



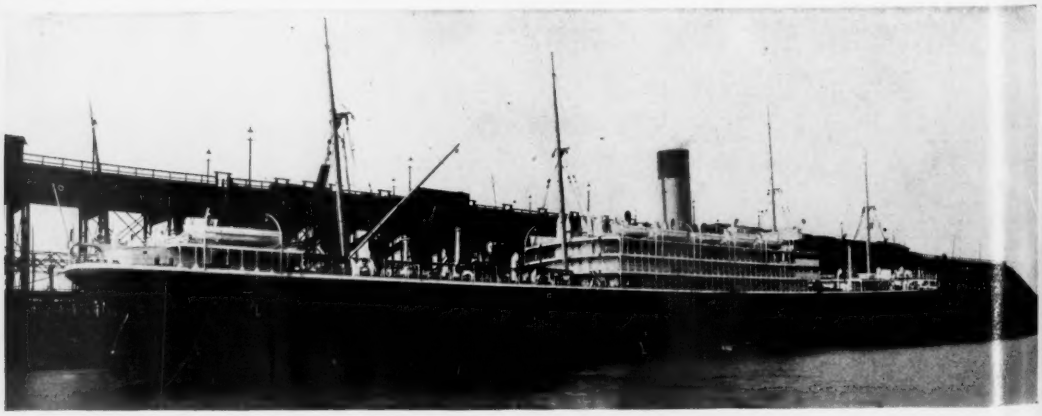
THE "BRITANNIA," THE PIONEER CUNARDER

Sailing from Boston, Feb. 3, 1844, through a canal 7 miles long cut in the ice

vessels, aggregating some 300,000 tons; the Leyland line, 46 vessels, of 293,015 tons; the American and Red Star lines, 26 vessels, of 186,000 tons; the Dominion line, eight vessels of 73,749 tons; the Atlantic Transport line, 12 vessels, of 78,798 tons; the Hamburg-American line, 157 vessels, of 772,440 tons (not all coming to North America, however); the North German Lloyd line, 120 vessels, of 556,178 tons (not all running to this continent); the Allan line, the Cunard line, the Elder-Dempster and Union-Castle lines, aggregating 203 vessels, of 1,014,490 tons; the French Transatlantic line; two Italian lines; the Holland-American; the Fabre; the Scandinavian-American and Wilson lines; and many more. In point of fact, the names of lines plying to and from the Western Hemisphere would fill a page of this magazine, and those of the world would fill two pages.

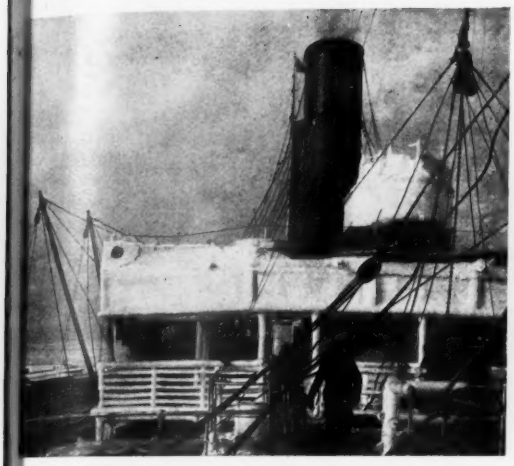
ROBBING THE SEA OF TERROR

The first problem for shipbuilders to solve was that of *speed*—speed sufficient to distance the fleet-winged packets of the early 'fifties and 'sixties. Next, *size*, in order to make the most of the mechanical improvements; then *comfort*, and finally, *luxury*. There remained *safety*—a problem unsolved to the present day, as the grim records of marine disaster testify. But safety has been so closely approximated that the transatlantic voyager now starts upon his journey with as little apprehension as the New Yorker has in setting out upon a

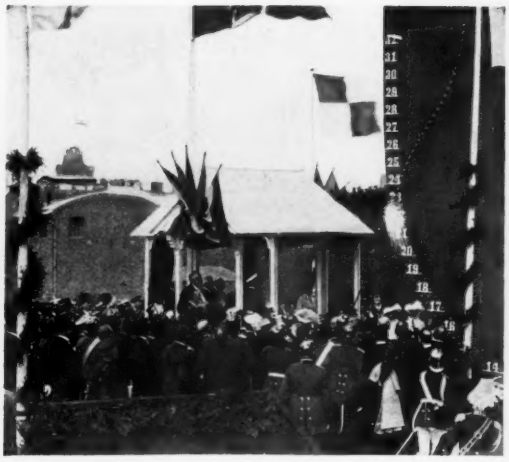


ONE OF THE TRANSPACIFIC FREIGHTERS

The *Dakota*, of the Great Northern Steamship Co., is a type of the huge vessels plying between the Pacific Coast and the Far East



A LINER IN WINTER'S GARB
The ice-covered *La Champagne*

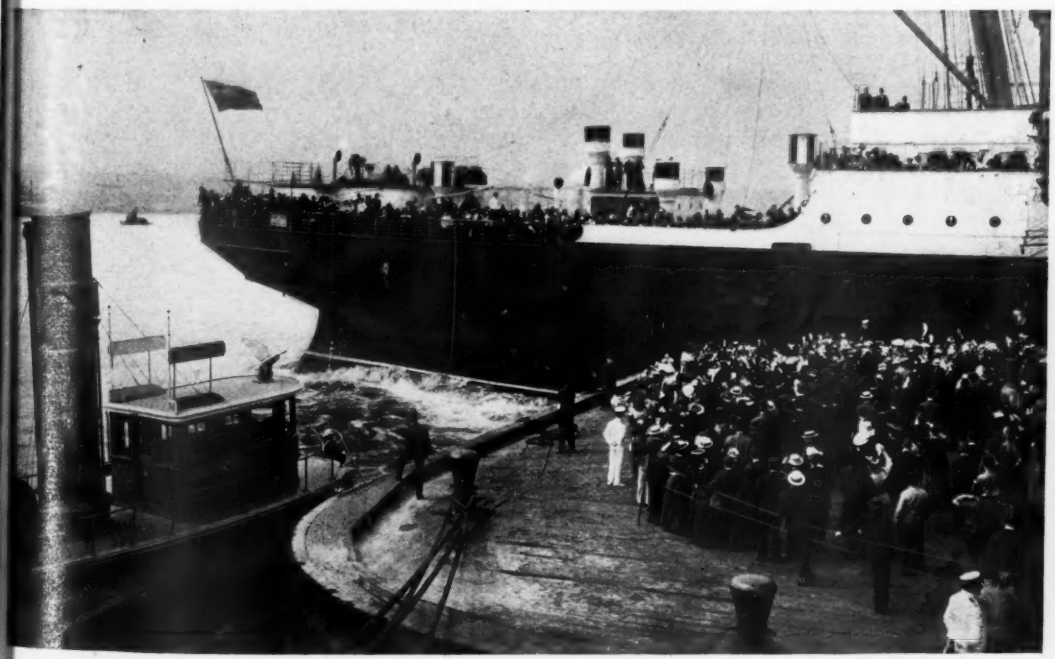


LAUNCHING OF THE "KAISER WILHELM II"
The German Emperor is in the centre of the picture, with a white cap

railroad journey to Chicago—and with better cause.

When the ill-fated Collins liner *Arctic* was rammed by the French steamship *Vesta* on the Grand Banks in 1854, she filled and sank in an hour or so. Beginning with the Guion liner *Arizona* in the 'eighties, the water-tight compartment system came into use. But the doors connecting the steel bulkheads could be closed only by hand, and the frailty of man in this respect has been demonstrated more than once, notably in the case of *La Bourgogne*, rammed and sunk by the sailing vessel *Cromartyshire* in 1898.

So swift has been the pace of progress that of all the crack vessels scheduled to leave the



Photograph by M. Lazarnick

A GREAT LINER PUTTING OUT TO SEA
As the carrying capacity of the Atlantic vessels continues to increase, the docks will need to be enlarged so that the passengers' friends may find room to stand and wave good-bye

THE HULL OF THE "LUSITANIA"

port of New York in 1895, only the Cunard liner *Umbria* and the *Philadelphia* (possibly a few others) are still in service between New York and Europe. It might almost be said that they are out of date; the *Umbria*, with her single propeller, certainly is.

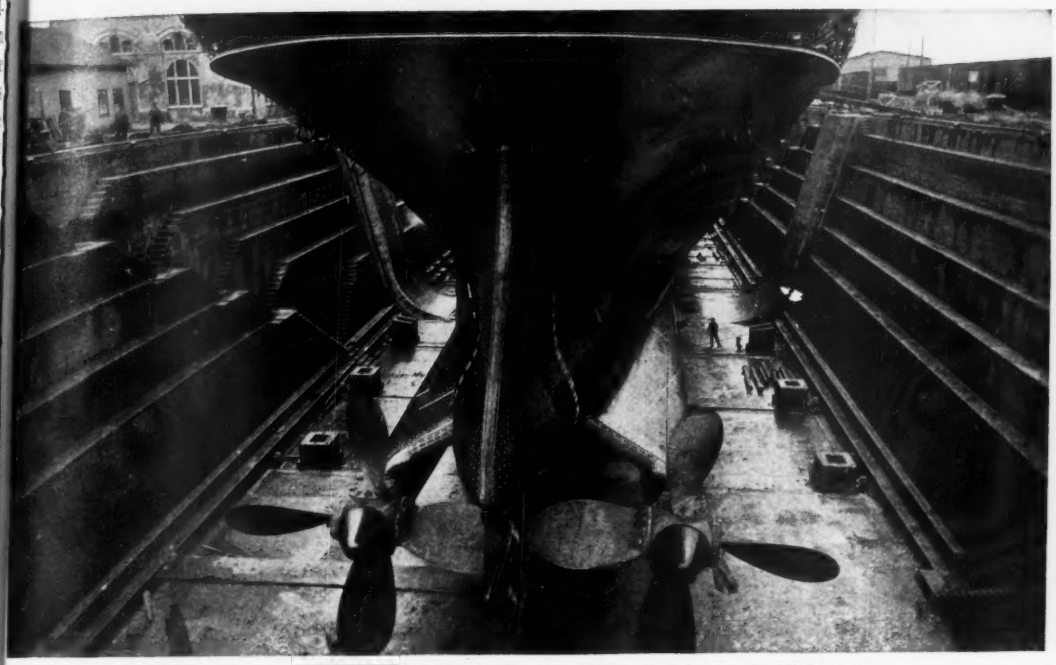
All the recent Atlantic liners are said to be, and probably are, unsinkable. They are protected from external accident by systems of water-tight compartments, having doors closed by a single officer on the bridge who, by turning a lever, may seal every compartment well-nigh hermetically. Should the officer fail in this duty, the compartment doors will close automatically when the inrushing water has reached the height of two feet above the bilge keel. Should a leak spring in the hull, it is not necessary that it be discovered; the compartment door through which the water is coming will close by itself. If a masthead or other signal light go out, an indicator in the wheel-house notifies the captain and tells him just what is the matter. If a shaft breaks, or a propeller be lost, the vessel may steam evenly under the other shaft and propeller. A submarine telephone service down in the hull, through which submerged bells hanging from the bottom of lightships or lighthouses may be heard, gives warning of fog-shrouded shores or shoals, while wireless telegraphy keeps the vessel in communication with the shore or with passing vessels throughout her entire journey. Should an explosion occur in the engine room, the doors automatically close and prevent the exit of steam and fire. Along the passageways of every deck are hydrants and coils of hose, and there is also a fire-extinguishing system by which sulphuric acid gas may be forced into any compartment, promptly smothering the flames.

In a word, where the greyhounds of the 'fifties had no compartments at all, and where those of 1893–94 have thirteen hand-closing compartments, the liner of 1906 has from sixteen to twenty-two compartments, closing automatically or by the hand of one man.

LUXURY OF THE MODERN LINER

Until now, liners have been more luxurious than safe; now they are both. Charles Dickens, in describing his journey to this country in the *Britannia* in 1842, said that his stateroom "was so small that it would hardly hold my baggage, had a hard slab-like seat covered with hair, while the bunks, of which there were two, boasted a very flat quilt, covering a very thin mattress, spread like a surgical plaster on a most inaccessible shelf. We passed from the deck into a long, narrow apartment, not unlike a gigantic hearse with windows at the side, having at the upper end a melancholy stove at which three or four chilly stewards were warming their hands, while on either side, extending down its whole dreary length, was a long, long table, over each of which a rack, fixed to the low roof and stuck full of drinking glasses and cruet stands, hinted dismally at rolling seas and heavy weather."

What are the experiences of an eminent English author who crosses the Atlantic in the



THE TWIN-SCREW PROPELLERS OF THE "KAISER WILHELM II"
Reciprocating engines furnish the power

modern greyhound? From the moment he leaves Europe, nothing will occur to disturb the illusion that he is living in a perfectly appointed hotel. John Jones, going to Europe for the first time, is met at the pier by willing porters and conducted to his stateroom. If he be accompanied by a family of any size and have the money, his apartment for the voyage will consist of bedrooms, parlor, bath, and toilet room, *en suite*. The suite is furnished with brass beds, with mahogany furniture in rich designs, with silk and damask draperies, and with velvet carpets. There are electric curling-iron heaters for Mrs. and the Misses Jones, movable electric reading lights and heaters —in brief, every convenience which taste even more refined than that of the Joneses could expect. These luxuries will cost Mr. Jones from $600 to $1,500 for the passage. If he desire to travel more cheaply, the ordinary staterooms are also beautifully appointed, only on a smaller scale.

Leaving his suite or his stateroom, and desiring to go to the saloon two decks above or below, Mr. Jones walks to the elevator shaft and presses the button. On vessels like the *Amerika*, of the Hamburg-American line, the elevators run through four decks; these are called the Kaiser, Washington, Roosevelt, and Cleveland decks, so that no nautical knowledge is required of Mr. Jones. If his wife or daughter have a birthday aboard ship, he may send a steward to the florist and purchase anything from orchids to "American Beauty" roses. If dining in the saloon grow monotonous, he may repair to the *à la carte* restaurant

QUADRUPLE PROPELLERS
Of the new *Lusitania*, turbine-driven

DROPPING THE PILOT

The last incident on the way to open sea. He returns in his little pilot-boat, which will also accommodate anyone who has taken too long to say good-bye to friends on the liner.

THE IMMENSE STEEL SHAFT OF AN OCEAN LINER

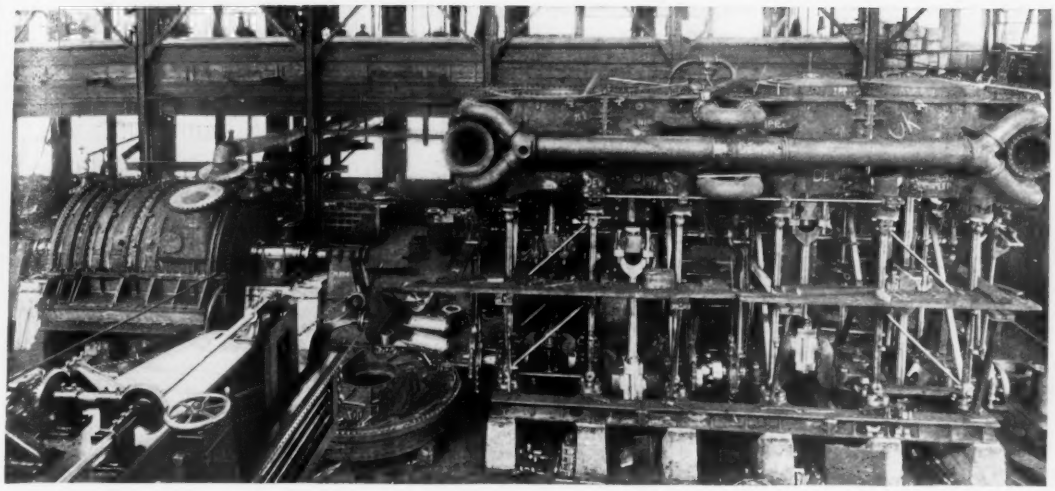
On the end of which are set the propeller blades

or to the palm garden, attractive features which have been recently introduced on some of the German liners, or to the Ritz-Carlton restaurant on the *Amerika*. Here Parisian decorators have secured beautiful effects, and an Austrian string band provides enchanting music. Mr. Jones may work off his energy in a large gymnasium, or he may go to the massage "emporium" and have it worked off for him. If he become ill, there is a hospital with a corps of skilled surgeons and trained nurses. If, on the contrary, the fortunate Mr. Jones be feeling particularly fit, so much so that a game of poker occurs to him, he may go to the telephone with which every stateroom is provided and call up a man he met the first day out, whose room is two decks below at the other end of the vessel. This man can call up two other good fellows and half an hour later the game is on in the smoking room. And what a smoking room! On the *Amerika*, it is modeled in the style of the hunting-room of an Elizabethan manor house. The walls are of solid oak, hand carved; if the weather be cool, a fire burns in the great fireplace—a fire of real logs—and waiters stand ready to supply anything that may be wanted in the line of drinks and tobacco. Throughout the vessel there are grand staircases, libraries with thousands of volumes, cozy corners, music rooms—everything that could occur to the mind of the most exacting.

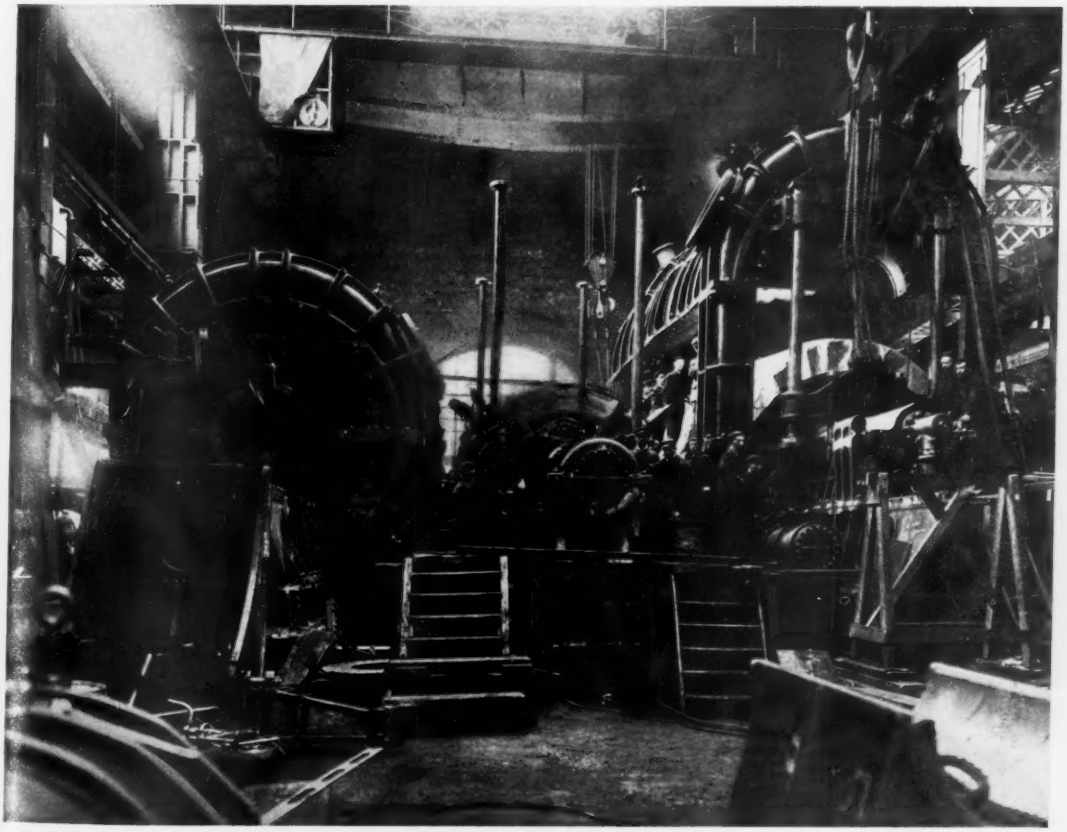
A ship like the *Amerika*, with her eight decks, carries 500 first-cabin passengers of the Jones type, 300 second-cabin passengers, and about 100 third-cabin; in all, including steerage, she can easily carry 3,057 passengers without crowding. She can carry 16,000 tons of cargo, which means that she could receive the contents of a freight train ten miles long.

In the two Cunarders *Lusitania* and *Mauretania*, are *en suite* rooms 10½ feet from floor to ceiling, several cafés, such as palm, verandah, and aerial gardens, in addition to the regular saloons, electric freight and passenger elevators, a children's nursery, 1,200 windows and sidelights, 500 ventilating windows, 5,000 electric lights, a hospital, and the like. The late Mr. Dickens, with all his imagination, would hardly believe all this without seeing it for himself.

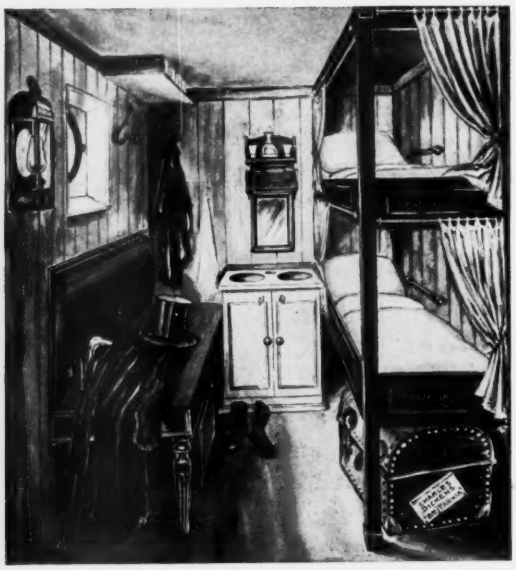
It is a city afloat, nothing less—a community transported more than 3,000 miles with considerably more than the comforts of home. It is difficult to realize the magnitude of this achievement. It is a jolt to the imagination to think that one may dine in a palatial



THE TURBINE ENGINE SIDE BY SIDE WITH THE RECIPROCATING ENGINE
The horse-power is the same; note the difference in space required
16x13x12 feet, 102 tons 33x11x21 feet, 153 tons



THE TURBINE EQUIPMENT OF THE 20,000-TON "CARMANIA"
The confusion is only apparent. The machinery is being set up



FIRST CABIN ON THE CUNARDER "BRITANNIA"
This is the apartment described by Charles Dickens

restaurant with the vastness of heaving, gray desolation all about; that he may sit listening to Handel's "Largo" or the latest cakewalk, dining from silver and rare china, with a menu including the pick of California fruits, oysters from Baltimore, beef from Chicago and New York, mutton from Berkshire, chickens from the Dorking farms, and the choicest supplies from London, Paris, and Vienna. Romance may indeed be waning, but magic has taken its place.

Think of the supplies for a single voyage carried by the *Deutschland:* 5,000 tons of coal, 400 tons of fresh water, 375 barrels of beer, 2,200 quarts of milk, 300 quarts of cream, 13,000 pounds of beef, 2,200 pounds of mutton, 1,700 dozen eggs, 600 pounds of ham, 900 pounds of fresh pork, 1,200 pounds of veal, 6,000 fowls, 175 barrels of potatoes, 400 pounds of tongue, 75 casks of assorted vegetables, 200 dozen heads of lettuce, 900 casks of flour, 8,500 pounds of fresh fruit, 1,300 pounds of butter, forty casks of oysters and clams, 600 pounds of cereals. A vessel such as this might be out at sea a month, filled with passengers, not a one of whom would suffer the slightest pang of hunger.

Photograph by Byron
BARBER SHOP ON THE "AMERIKA"

GERMAN AND BRITISH RIVALRY

And what has brought about all this luxury? What has been the real impelling motive in maritime progress? Competition, rivalry; nothing else. First, the majority of passengers rushed to the transatlantic liner which could carry them over the ocean in the shortest possible time. Even in the early days this was so, and it is so to-day—luxury, size and everything save speed notwithstanding. After the early period of racing, the years from 1884 to 1894 inclusive, in which the record for the swiftest trip across the Atlantic was held consecutively by a dozen different vessels, British ship owners began to build vessels of great size but of relatively slow speed—six-day boats such as the *Oceanic*, *Baltic*, and others. They declared that excessively high speed did not pay, in the face of the fact that the North German Lloyd and Hamburg-American lines continued to struggle for speed supremacy on the sea, producing such flying palaces as the *Kaiser Wilhelm der Grosse*, the *Deutschland*, the *Kronprinz Wilhelm*, and the *Kaiser Wilhelm der Zweite*, until in point of swift vessels the German companies ruled the sea.

Even in point of luxury, the German lines held undoubted supremacy. The British idea was, and in many cases still is, that the passenger should accommodate himself to the requirements of the ship. The Germans started

Photograph by Byron
KITCHEN ON THE "AMERIKA"

Photograph by Byron

PICTURESQUE NURSERY ON A GERMAN LINER

with the assumption that the passenger should have his wishes and prejudices recognized on shipboard as fully as though he were ashore. The result was these palm gardens and elevators and other luxurious appointments. And, moreover, it all paid, and paid munificently. It was found that the public was just as willing to pay for a good thing on the sea as on the land. The new Cunard liners, *Caronia* and *Carmania*, prove that the British have begun to learn the lesson which the Germans have taught, and absolute proof will be found in the great leviathans recently launched for the Cunard line—palaces as well as record breakers.

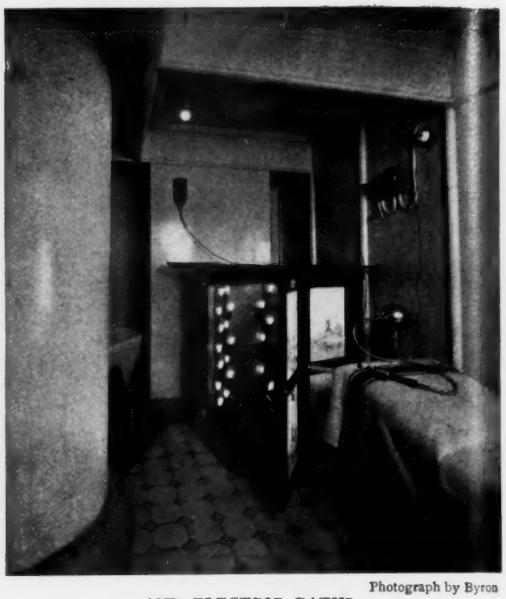
Progress will not stop with the production of the Cunard liners. Within a week of the launching of the *Lusitania*, which is 790 feet long, announcement was made that the Hamburg-American line had ordered a new vessel designed to eclipse the Cunarder, while embodying many of her features. The designs call for a ship 800 feet long, with a beam of ninety feet and a gross tonnage of 35,000. When it is recalled that the longest liner now afloat is 705 feet long, the great jump in marine construction is made manifest. Both the *Lusitania* and her sister ship, as well as the new German liner, will be twenty-five-knot boats, that is, four-and-a-half-day boats.

THE WONDER-WORKING TURBINE

In 1840 the *Britannia* crossed the Atlantic in twelve and a half days. In 1852 the Collins liners were crossing in nine and ten days. The Hamburg-American liner *Deutschland* holds the present transatlantic record—5 days, 7 hours, and 38 minutes over a course of 3,112 miles. Over the same course, the *Kaiser Wilhelm II* has made the trip in 5 days, 11

Photograph by Byron

THE NEWEST LINERS HAVE ELEVATORS



Photograph by Byron

AND ELECTRIC BATHS

THE GRAND DINING-ROOM ON THE "ST. LOUIS" AND "ST. PAUL"

It accommodates 864 guests

Photograph by Byron

A WINTER-GARDEN ON A HAMBURG-AMERICAN LINER

The à la carte system, with private tables, is replacing the old-style dining room

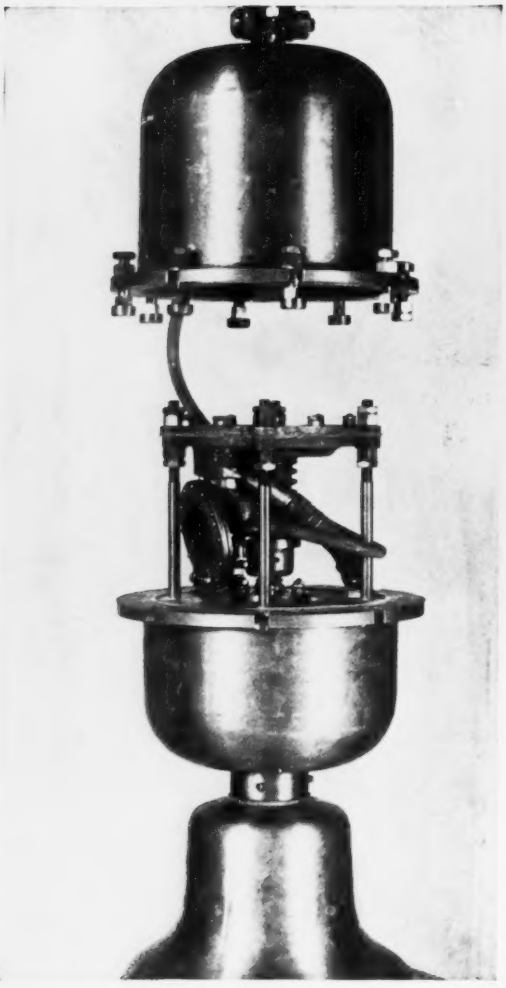
hours, and 50 minutes. The *Lucania* has made the Queenstown course of 2,750 miles in 5 days, 7 hours, and 23 minutes. The highest hourly average ever made by an ocean liner, 23.58 knots, goes to the credit of the *Kaiser Wilhelm II.*

The twenty-five-knot boat is probably an impossibility with the reciprocating engines; that lies in the province of the new turbine. A turbine engine, in a word, is the old mill and its water turned to steel and steam. A succession of cylinders with angular blades set on their circumference is blown against by powerful streams of steam. Naturally the cylinders revolve. Now, as they are flanged to the shafts on the ends of which are the propellers, the screws revolve also. The resultant motion applied to a hull is smooth and almost imperceptible. Turbines were first applied on a large scale on the new Cunarder *Carmania* and their success has opened a new field in the conquest of the ocean. The turbine method of propulsion, being the latest and most advanced mechanical device for obtaining speed at sea, deserves more than passing mention. It has excited widespread interest because of its radical departure from old and supposedly well established systems of steam power. It has been demonstrated, however, that the turbine has reduced vibration to a minimum, a striking victory, as all who have traveled on vessels furnished with the old

Photograph by Byron

THE GYMNASIUM ON A GERMAN LINER

After exercise, the instructor will direct you to the swimming pool

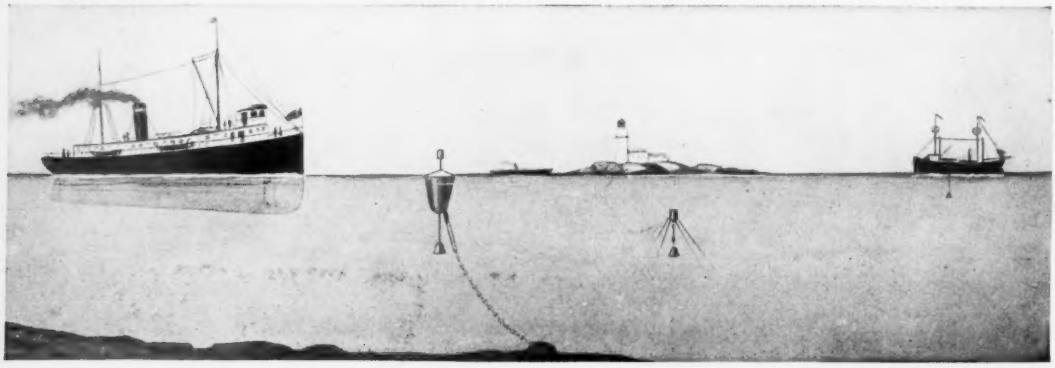


THE MECHANISM AT CLOSE RANGE

LISTENING FOR THE DANGER SIGNAL
The apparatus indicates both the direction and the distance of the peril

reciprocating engines can testify. That the matter of speed maximum is only a matter of further development, is accepted in authoritative quarters.

It is only a little more than eight years ago that the little steamboat *Turbina*, fitted with turbines of the Parsons type, created deep interest at the Diamond Jubilee. Later, when the Cunard Company and the British public, frightened almost to the verge of panic by the power implied by the formation of the American



By courtesy of the Submarine Signal Co.

THE CHIMES THAT GIVE WARNING AT SEA

The rocking buoy anchored over the reef rings a submarine bell; the submerged bell to the right is rung by electricity from the lighthouse. Each of the above ships has bells below the water-line which ring during a fog. The sound is transmitted through the water to the telephonic receivers of all vessels in the neighborhood so equipped

Copyright, 1906, by Edwin Levick

ENJOYING ALL THE THRILL OF AN AUTO RACE

Photograph by E. Levick

THERE IS LUXURY AS WELL AS SPEED IN A MOTOR BOAT

The couches on either side are convertible into berths. Beyond are two cabins with a centreboard between
Formerly this space would have been needed for the steam engine

Photograph by E. Levick

A TOURING-CAR, WITHOUT THE DUST

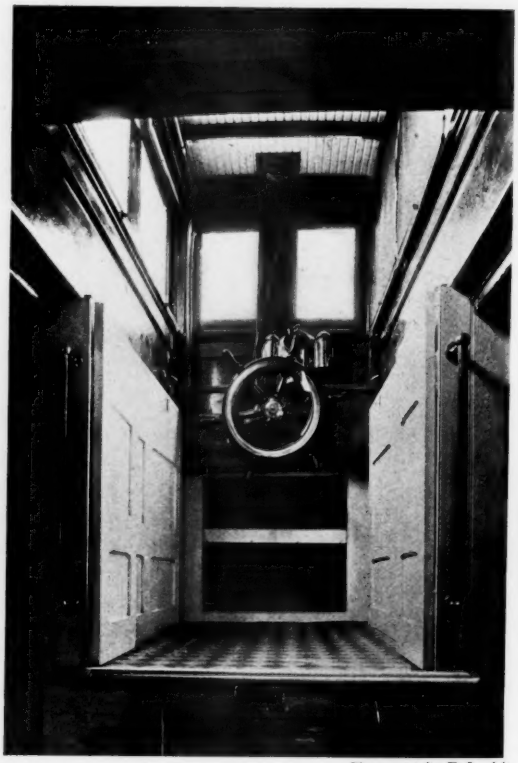
An ideal pleasure boat, motor-driven, built with a view to the comfort of ladies

Mercantile Marine Company and the sweeping successes of the German lines, began to consider such boats as the *Mauretania* and *Lusitania*, the British cruiser *Amethyst* represented the greatest horse-power applied to marine turbines. It had already been decided that turbines furnished the only road to maritime speed supremacy. But horse-power of from 68,000 to 70,000 was demanded of the prospective boats. The *Amethyst*, with her three sets of turbines, was designed for only 14,000 horse-power. Thus the unexplored field of endeavor that lay before the builders may be appreciated. As the Cunard Company naively declared, there was need for hurry lest the German lines got too far ahead even to be caught; yet the matter demanded deliberation and patience. A government commission was appointed and the question of turbine engines was studied from every standpoint. Exhaustive model tests were made, with the result that turbine engines of 21,000 horse-power were recommended and later applied to the *Carmania*. At the same time, it was decided to use reciprocating engines of the old

Photograph by E. Levick

A MOTOR CRUISER, FROM WITHIN

The *Norka* is a government boat for inspecting coast defenses. Note the wheel at the far end of the room, between the two cabins



Photograph by E. Levick

AN EMERGENCY PILOT HOUSE

This is the wheel seen in the other picture. In bad weather the *Norka* may be comfortably steered from within by this wheel

Photograph by E. Levick

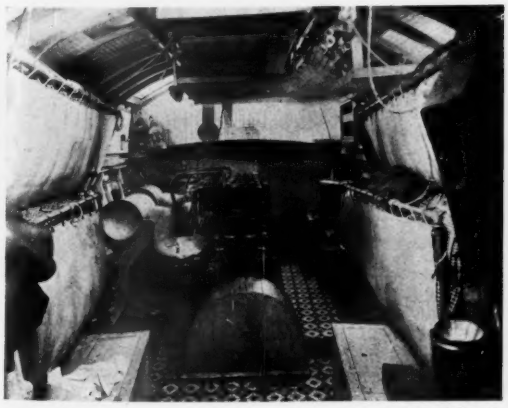
AN AUXILIARY 70-FOOT MOTOR BOAT

This swift pleasure craft is propelled by motor power but is equipped also with sails. Its size enables it to carry a larger crew without crowding the guests

Photograph by E. Levick

A GENTLEMEN'S 35-FOOT KNOCKABOUT

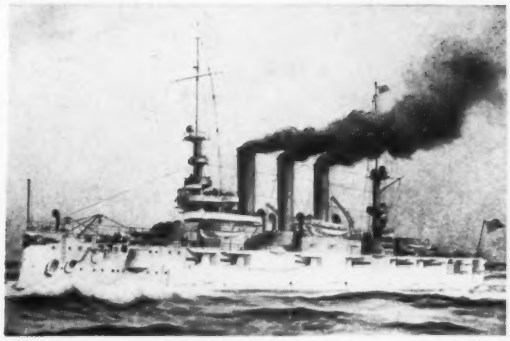
It is less comfortably arranged than a motor boat for ladies' use on account of its smallness



Photograph by E. Levick

THE ENGINE-ROOM OF A 75-FOOT MOTOR BOAT

The space required for an old-style engine is here ample for the accommodation of the entire crew. The bunks are on each side and a table is suspended above the centre



AMERICA'S STAUNCHEST WARSHIP

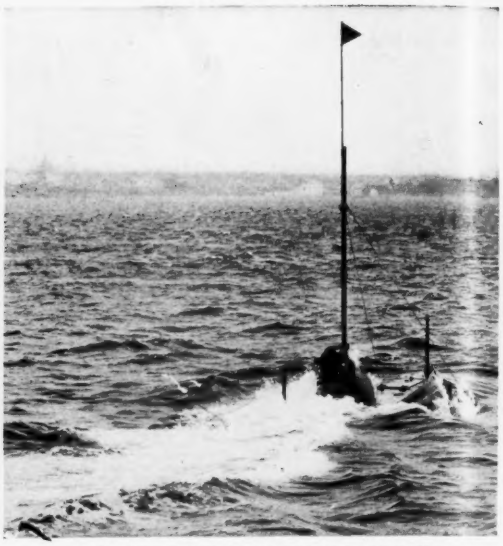
The sister ships *Connecticut* and *Louisiana* were begun and completed in about the same time, one by the navy under the eight-hour law, and the other by contract without such restriction. The race was watched with great interest by labor unions and by government officials

A FLOATING GIBRALTAR

This, the battleship *Dreadnought*, is the most powerful British warship but the Japanese *Satsuma*, recently launched, is expected to be larger and speedier. It has been modeled on the same lines as the *Dreadnought*, but was built in Japan

THE SUBMARINE "FULTON"

Skimming along on the surface of the water under gasoline motive power



THE "FULTON" DROPPING FROM VIEW

The submarines can quickly sink to the bottom. In this view electric power was being used

type in the *Carmania's* sister boat *Caronia*. Practical experience has demonstrated the marked superiority of the *Carmania's* motive power.

Then it was that general belief in the 70,000 horse-power engines of the *Lusitania* and *Mauretania* took hold of the maritime mind throughout the world. The British navy has adopted the turbine system for all new vessels, and it seems assured that in course of time no other method of propulsion will be recognized for boats of high class.

The primary intention of the Cunard Company was to make the two new vessels recently launched the swiftest in the world. The fact that they are also the largest is merely incidental. The size was decided upon simply as furnishing the best conditions for speed.

The great jump in horse-power necessary to obtain less than two knots greater speed is significant. For whereas the *Deutschland* and *Kaiser Wilhelm II* have about 40,000 horse-power, the new Cunarder must generate 70,000. She will have four propellers, two for going astern and two for headway. To supply these turbines with steam requires twenty-five boilers with 192 furnaces. The steam pressure will be 200 pounds to the square inch. The furnaces will eat up 5,000 tons of coal a trip; the *Britannia*, in 1840, burned 570 and the *Umbria* in 1884 burned 1,900 tons. The *Campania* burns 2,900 tons to-day. In order to increase speed three-fold, power has been increased a hundred-fold and the coal consumption per voyage nine-fold. This has meant the outlay of immense sums of money,

Courtesy of the Electric Boat Co.

THE HIDDEN TERROR OF ALL FUTURE "DREADNOUGHTS"

The ripples show where the *Fulton* sank, but there is nothing to tell where it will rise. It can place a mine under a battleship and escape unseen before the explosion

but it pays, as the German companies have demonstrated. Had it not paid, the present status of the fight to conquer the deep would be a century from attainment.

PRESENT HARBORS TOO SHALLOW

The wonderful growth in the size of vessels has of course necessitated the deepening of approaches to ports. Twenty years ago, when the Gedney channel off Sandy Hook was deepened to twenty-five feet, the newspapers of the time teemed with prophesies that the port of New York need never fear that vessels too large to enter this harbor would be built. But advancing years proved the falsity of this, and the Government has never ceased dredging its riparian possessions. Now comes the problem of the *Lusitania* and *Mauretania* with their load drafts of 37 feet 6 inches. At present, vessels of such depth could not enter this harbor at all. By next summer, government engineers say, the new Ambrose channel leading in from sea will have been completed sufficiently to give passage for vessels drawing thirty-four feet at low water, and for vessels drawing from thirty-nine to forty-odd feet at high water. This would allow high-water passage for the Cunard giants. By 1910 the Government promises that the Ambrose channel will afford a forty-foot passageway at low water. Thirty-one feet is the record draft of the present day of vessels plying the tortuous channel which now leads to deep water. Some idea of the work involved in the dredging of the Ambrose channel through banks of prehistoric mud may be gained when it is stated that it is to be 40 feet deep, low tide, 2,000 feet wide, and seven miles long. The total cost will be about $2,000,000, which strikes one as immense until it is realized that the vessels for which the channel is being deepened cost more than $3,000,000 apiece. In many other important harbors the same work is going on—the work of making the ocean deep enough to float the ships which man's ingenuity has already produced.

PROGRESS IN OTHER WATERS

On all the other oceans progress has not been accelerated by the white-hot competition which has characterized the conquering of the Atlantic. Yet these waters have been no less conquered, despite the absence of high-powered leviathans. The companies running lines of steamships from San Francisco or Seattle or Portland can boast of no *Lusitania* or *Kaiser*, and yet such vessels as the *Manchuria* and *Mongolia*, of the Pacific Mail Steamship line, the *Empress of India*, of the Canadian Pacific line, and notably the *Minnesota* and her sister ship of the Great Northern Railroad system, boats of nearly 14,000 tons, fulfill adequately the requirements of a trade which includes three-quarters of the world. Then there are the Oriental and Occidental, the Ocean and the Toyo Kisen Kaisha steamship companies, leaving San Francisco for Far Eastern points; the Peninsular and Oriental company of England, connnecting three continents; and hosts of other lines, such as the Cie. Belge Maritime du Congo—lines large and small, running to byways of the world, the names of which do not look half-civilized in print. The two great German companies send their vessels to nearly every country on the globe and the Hamburg line is now planning to stretch its system over all the waters of the earth. Tramp steamships of England, Norway, Sweden, Italy, and Germany dot the waters of the world from the Arctic to the South Pacific, seeking cargoes wherever they may be found, braving wind and weather of all seasons, manned by sailors who yield in neither bravery nor skill to any mariner the world over.

THE COASTWISE FIGHT

No less thrilling than the conquest of the deep sea has been the conquest of the coastline of the United States—a coastline of 5,000 miles, counting the two great oceans and the Gulf of Mexico. What distances were here to be overcome! One of the shortest routes is from New York to Boston, 300 miles. From Boston to Philadelphia is 477 miles—more than the distance from Plymouth, England, to Bordeaux. A vessel travels 515 miles from Boston to Newport News; it is 530 miles from England to Spain. From Portland, Maine, to Savannah, Ga., is 971 miles; a deep-sea trip from England to Portugal is less than that. A coastwise liner steaming from Portland to Key West travels 1,400 miles; an English steamship plying from London to Cronstadt has less distance to cover. A Morgan liner, leaving New York for New Orleans, steams 1,740 miles. These figures will give some idea of what lay before the American mariner when he began to think of connecting the ports of this country. Magnificent steamships have been called into being that the fight might be

successful. There are the vessels of the Ward line, a fleet of them, and particularly vessels of the *Havana* and *Morro Castle* type, as large as transatlantic liners; then there are the Morgan, the Atlas, Cromwell, Munson, Clyde, Old Dominion, Porto Rico, and a dozen other lines, which communicate with all ports on the Atlantic and Gulf coasts with the regularity of railroad trains. There are five great clipper lines, the vessels of which leave New York for San Francisco, 13,610 miles, and several from Boston to San Francisco, and to Puget Sound, 15,000 miles, This immense fleet adequately maintains all the best traditions of square-rig seamanship. Aside from coasting steamships, the trade supports more "wind-jammers" than ever before. The modern American coasting schooner is a craft to delight the eye, thoroughly seagoing, of two, three, four, five, six, and even seven masts, able to stand the worst gale that the ocean can brew, and in every way to take what comes. Five, six, and seven-masted schooners, with a capacity as great or greater than the coastwise steamships, fill certain requirements of the coastwise trade adequately, and it is safe to predict that they will never disappear therefrom. The latest development in the trade, and one which will revolutionize the building of sailing vessels, is the seven-masted steel schooner built a year or so ago at the yards of the Fore River Ship and Engine Company, a steel schooner 368 feet long, 50 feet wide, 34 feet deep, with a tonnage of 5,200, and with a capacity of 8,000 tons cargo. The sails are hoisted by steam power, and in every way mechanical devices have been applied so that a crew of only sixteen men are necessary to run her. A square-rigger of the size of the schooner requires a crew of forty men.

A schooner of this kind costs fully two-thirds less to run than a steamship costs, and the consequent value of the wind-driven craft is obvious. In 1840 the coastwise tonnage of the United States was 1,144,644. In 1901 it was 4,488,421. It is now more than 5,000,000 —significant figures of steady progress.

The square-riggers are doomed, and are being converted into coal barges. Their day has waned, their vital usefulness vanished. Even the recent feat of the ship *Drumeltan*, which went from this country to the west coast of Africa and back (14,000 miles) at the average speed of 138 miles a day, will do nothing towards the production of more ships of her kind, or to stave off the day when the ocean will know that type no more.

MONSTER FREIGHT BOATS

Yet the Germans have realized that with all the blare of record-breaking greyhounds, constructed entirely with an eye to the needs of passengers, the needs of commerce must not be neglected; that is the secret of their success. They built not only fast steamships, in which the space for cargo as a result of increased machinery and passenger accomodations was necessarily small, but they built also vessels essentially designed for cargo, with passengers a secondary consideration—such boats as the *Pennsylvania*, *Pretoria*, *Patricia*, *Barbarossa*, and a host of others: boats of abysmal hulls, capable of carrying in one trip from 16,000 to 22,000 tons of freight. Freight, in fact, is the main source of revenue of a steamship company. It occupies the relative position in a steamship line that advertising does in a newspaper or magazine. A great maritime transportation company must carry a large amount of freight or fail of its destiny. That the English companies learned this lesson is evidenced by vessels of such immense cargo capacity as the *Celtic* and *Baltic*, and a dozen others. Where the *Britannia* in 1840 carried a few hundred tons of light cargo, the modern carrier transports thousands upon thousands of tons of anything the public cares to ship. Loading by steam and electricity at from four to six hatches at one time, street cars, locomotives, entire outfits of factory machinery—everything is lifted from the dock and lowered to cavernous depths as easily as though it weighed a few pounds instead of a dozen tons. It has been estimated that the fleet of freight vessels leaving New York in a fortnight could carry sufficient necessities and luxuries of life to keep London going for a week. A statement such as this may sound wild; but it was based on careful estimate. It is an eloquent suggestion of the harnessing of the ocean from a purely commercial standpoint.

SWIFT-FLYING MOTOR BOATS

But the real flyers of the seas, recurring to the question of speed, are the modern autoboats that cut through the water with the swiftness of railroad trains. Picture a boat forty feet long (about the length of a large street car) and about five feet wide, drawing not more than eight inches of water, a boat with a razor-like stem,

with a hull shaped like the letter U, and a flat stern resting on the top of the water—this is an autoboat. It is not much heavier than a canoe. The frames are not more than an inch square, and the hull coverings are nothing more than two thicknesses of cedar veneer. One of these forty-foot boats, built to go at a speed of thirty-five miles an hour and launched last year, weighed only 575 pounds. If this boat should strike a log at full speed, she would curl up and go to pieces as though she had hit a stick of dynamite. It is only a plaything, a racing machine, but its development has not been a waste of time. For one thing, the gas engine was evolved, and this sort of engine has proved so successful, so durable, so productive of great speed, that the Government is now applying it to torpedo boats. One advantage a gas engine has over a steam engine is that with a touch full speed is at once applied to a boat. Life-boats fitted with these engines are used with good results at Sandy Hook and Fire Island. Further development will reveal further possibilities on a scale as yet undreamed of.

BATTLESHIPS AND SUBMARINES

The navies of the world have kept pace with the advances of the merchant marine. Battleships which are nothing less than floating forts, with a radius of action of 3,000 miles, and with a speed capacity of twenty-odd miles an hour, are ever ready to assert the supremacy of their respective flags in whatever clime. From the old, square-sailed ships-of-the-line to these floating hills of steel has been a far shorter cry than from the first steam merchant vessel to the latest greyhound. As late as 1870, the iron war vessels might have been counted on one's fingers; nearly to 1880, the steel vessels might have been so counted. And what now? The British battleship *Dreadnought*, recently launched, a vessel twice as powerful as any battleship in service. With its 18,500 tons displacement and a maximum speed of twenty-one knots, contrast our latest fighting giants—the *Louisiana* and *Connecticut*—of 16,000 tons. In truth she will render all present battleships as obsolete as the *Monitor* of the Civil War rendered steam frigates obsolete. Assuredly the other powers will not rest at ease until they, too, have equalled, or exceeded the *Dreadnought*. The United States is in no hurry to enter this contest. When the bids were opened recently for the new battleships *Michigan* and *South Carolina*, the turbine bids were all passed over by the board, and reciprocating engines were contracted for.

It is the sentiment among naval officers here that it will be just as well to let the British authorities go ahead with the experiments on the *Dreadnought* and try out the turbines. Then if they are found to be successful, it will be time enough for us to follow the lead. Early in the Russia-Japan war the experts formed the opinion that the torpedo boat had demonstrated its superiority as an element of sea power, but future events ending with the battle of the Sea of Japan brought new convictions, and the corps of British experts hurrying homeward with their notes at the conclusion of the war testified so conclusively in favor of the battleship that the designing of the *Dreadnought* was the result.

No sooner had the partial facts concerning the *Dreadnought* come to light than the announcement was made from Tokio of the laying of the keel of a battleship which, in point of size and range and efficiency, would transcend the new English sea-fighter. From what can be learned it is practically certain that the new warship will exceed 19,000 tons, and that her gun-fire standard will more than equal that of the *Dreadnought*. The *Satsuma* embodies all the lessons grasped in the war with Russia.

Together with the building of the *Dreadnought*, the construction of submarines holds the minds of technician and layman alike. No nation has made further advances in the development of submersible craft than the United States, although American inventors have been obliged to go abroad to obtain adequate hearing. While not yet perfected, the status of the submarine boat is eminently hopeful. France is experimenting with them with excellent results—so far as harbor defence is concerned—while in this country to-day a boat has been produced which, according to claims, will run submerged at a depth of 125 feet for 400 miles, at an average hourly speed of fifteen knots. It is also maintained that while submerged she can fire a torpedo, reload and fire another one, and that a man may leave the boat through the diver's door while she is submerged. This represents the limit of advance in boats of the kind, and it is good to know that she is American built and American designed. Surely the dreams of Jules Verne cannot be far from realization.

THE INTERURBAN TROLLEY FLYERS

A NECK AND NECK COMPETITION WITH THE RAILROADS

BY

JAMES GLEN

WHILE the steam railroads are making great progress, the interurban trolley lines are rapidly taking on the very form at which the railroads are aiming. Their great empire is the Middle West, where, in Michigan, Ohio, and Indiana, they have been brought to their highest development. The older ones follow the highways. The newer ones are laid on their own right of way. Experience has proved that they can get just as much business, passenger, baggage, and freight, by cutting out a line of their own as by sticking close to the highway, and just as much by entering towns and villages at the back door, in the manner of the railroads, as by following the main street. There are commodious terminals in a number of cities where several of the interurban lines meet. Cleveland has a union freight station.

The best cars are from fifty to sixty feet long. They all have features resembling those of the most luxurious cars of the Lima and Toledo line, which have outside seats on a long platform, high-backed plush seats for the regular passengers, upholstered seats and a couch in the smoking compartment, and a baggage room. At first the baggage and express compartments were omitted from the limited cars to save space, but it was found that most of the passengers taking the long rides—especially drummers going from town to town—required baggage facilities. A toilet room is, of course, a necessary adjunct. Many of the cars are single ended, a form of construction which gives the motorman a definite cab which is connected with the baggage room, so that he can act as baggage-master.

There is a growing tendency to abandon the rule of starting cars from terminals every hour in favor of the railroad method of starting them at irregular times to secure the maximum of traffic. Cars are frequent at busy times and infrequent at the hours when travel is light. In the seasons of greatest traffic some of the roads have a half-hourly service. Many lines have gradually lengthened the distance between stopping points until now it is a regular practice to have stations a mile apart; though many roads still have them closer together. The limited cars, of course, make fewer stops than the locals with shorter runs. The "Marion Flyer," for an extreme example, makes only two scheduled stops between Marion, Ind., and Anderson, a run of 72 miles. On some of the limited cars an excess fare is charged; on some the fare is the same proportionately as on the local cars. The longest runs are made over the tracks of several companies. Six limited cars a day, for example, run the 162 miles between Dayton, O., and Toledo in six hours over the Dayton and Troy, the Western Ohio, and the Toledo and Interurban roads. The 138 miles between Indianapolis, Ind., and Fort Wayne are covered in 4 hours and 40 minutes over the Indiana Union Traction line and the Fort Wayne and Wabash Valley. On this run lunch is served in a buffet compartment. On the Lake Shore Electric line, and on two or three others, the cars are run in trains—the development that is the last step in transforming the street-car into the transportation device of the future.

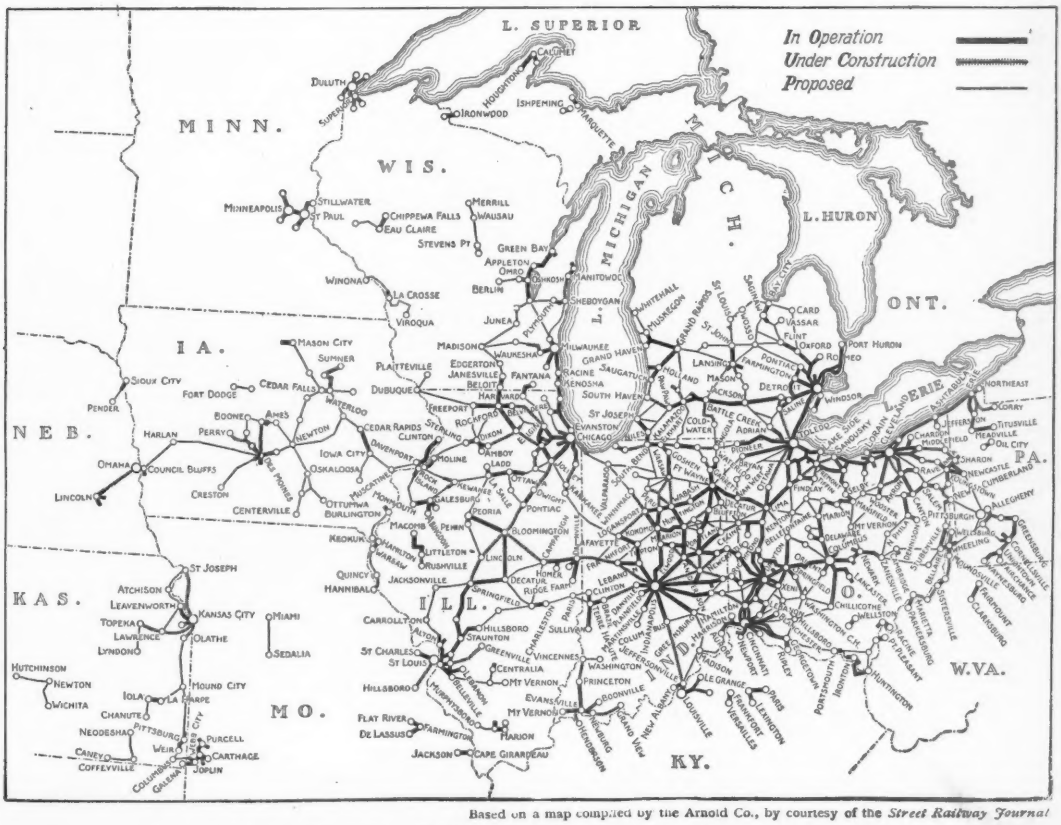
Most of the roads in Ohio charge two cents a mile for a one way fare. The lines in Michigan and Indiana charge from one to two cents. Competition with the steam railroads, which has cut down the steam railroad passenger traffic enormously in many places, is made successful by charging less than the steam railroad charges for a round trip. It costs $3.05 to go from Toledo, O., to Dayton by steam train, and $3.05 to return. The fare on the electric limited is $3.00 for the single trip and $5.25 for the round trip. There are all sorts of mileage books, commutation books, school children's tickets, family tickets, workingmen's tickets, good at certain hours, and all

the well-known railroad devices in use on the various lines, which bring down the fare for most of those who travel to one cent a mile and often lower.

These advantages have led the people in the manufacturing towns in Ohio and in the rural districts of Indiana and Michigan into the traveling habit. Traffic from city to city is heavy. Nearly 113,000,000 passengers were carried in Indiana alone in 1905. Travelers go every day from Cleveland, O., to Detroit, Mich., a run of 180 miles. Tickets are often sold for a trip from Dayton, O., to Detroit, Mich., nearly 300 miles. It is possible to travel four hundred miles from Cleveland, O., to Indianapolis in a day by interurban limited cars. Many trips of 200 miles and more can be made more quickly than by steam train, simply because electric service is so frequent that long waits for trains are not necessary. When all the lines now under construction and projected are completed, it will be possible to go from Portland, Me., to Lincoln, Neb., by trolley.

The freight and express business has been developed to a high point of efficiency. Not only do the farmers come down to the crossings with their milk and other farm produce to send them rapidly to town, but, curiously, an even heavier traffic is being kept up from town to town. It has been found more profitable to have the farmers drive to the towns and villages and sell their produce to shippers, and to load the cars heavily at these central points. The farmers are willing and the freight cars can operate more economically through making fewer stops.

At first it was feared that the interurban lines might destroy the small towns by making it too easy for the farmers to do business in the great cities. But, on the contrary, it has been found that a large and increasing part of the interurban freight business consists of shipments of goods made from the big cities to the country stores. Investigation has proved that the little and big towns of Indiana served by the interurban lines are growing faster than those served by the steam railroads.



Based on a map compiled by the Arnold Co., by courtesy of the *Street Railway Journal*

THE SPREAD OF THE TROLLEY NETWORK IN THE MIDDLE WEST

COMMUNICATION BY WIRE AND "WIRELESS"

THE WONDERS OF TELEGRAPH AND TELEPHONE

BY

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AT MIDNIGHT on December 31, 1903, the ticking of a clock in the United States Observatory in Washington was transmitted over the telegraph wires and heard at the Observatory in Greenwich, England; in Rome; in Adelaide, Australia; in the Fiji Islands; at Manila; at Sitka, and as far south as Buenos Ayres. The telegraph carried the beats second by second for five minutes to two-thirds of the civilized world. The transmission to San Francisco took half a second; to Rome, 1.10 seconds; to the Coast Survey Station in Alaska, 1.70 seconds. The beats reached the Survey Office in Brisbane, Australia, in 2.45 seconds after they were sent; and Cordoba Observatory, Argentina, in 7.70 seconds. The day is not far off when the ticking of this clock will be heard around the world. Even now, for the five minutes just before noon, the time-clocks in Washington and the Mare Island (California) Navy Yards automatically send the exact time to practically every telegraph station in the United States, to Havana, and to Panama; and, in all the principal ports, time-balls are dropped so that the ship chronometers may be corrected.

We have become so accustomed to the telegraph and its feats that they seem commonplace; it is difficult, even by considering the magnitude of the business that we do by wire, to realize its wonder and the important part it plays in modern life.

THE PRINTING-TELEGRAPH SYSTEM

We have a million and a half miles of telegraph wire; and one of the main offices in New York—The Postal Telegraph Company—handles 75,000 messages a day. In these large offices any wire can be automatically connected with any other wire—a local wire from a near-by town, for example, with a main wire to Chicago. And, if need be, a repeating machine can be attached so that if the ticks come on one wire feebly they can go out on the other invigorated, the repeating being instantaneous, automatic, and infallible. To catch possible errors of operators, there is a machine that automatically records on a spool of paper every dot and dash that comes into the office. But such devices are being rendered obsolete by printing-telegraph systems. Under the Rowland method, operators can send thirty words a minute by playing a keyboard similar to that of a typewriter. Within a quarter of a second, the characters are printed at the receiving station. They also appear on a strip of paper in front of the operator for reference.

In the main Western Union office in New York, with its seventy trunk lines to Chicago, Mr. John C. Barclay's machine is taking the place of the old system. Guided by a strip of paper which has been perforated by a typewriter, it automatically telegraphs, and another typewriter automatically writes the message down at the office where it is received. All these machines lessen the chance of error, which is one of the great problems of the telegraph companies. Once, a telegram which started across the continent as "*Gott sei mit dir*" and finished its journey as "*Go to see mit sis*," required twenty-one reports to show how the transformation had occurred. At another time, a telegram reached a Louisville newspaper from its Washington correspondent, saying that a prominent Kentucky politician was dead. The paper printed his portrait and a long and flattering obituary notice, which the man read on his way home the next day. The code word in the correspondent's telegram meaning "is here" had been changed somewhere in the transmission, to the somewhat similar word meaning "is dead."

The rapidity of these Barclay machines increases the earning power of the wires. On

it an average of one hundred messages an hour can be sent over a wire, which means that over the seventy Western Union trunk wires from New York to Chicago, 7,000 people in New York can telegraph to 7,000 others in Chicago and receive answers every sixty minutes; for the replies can come back on "phantom" wires. By the Rowland system, four operators on each end of the wire can together send nearly 600 messages an hour over a single wire. This is also by the use of the "phantom" wires. "Phantom" wires are the production of a system which makes it possible to send more than one message over the same metallic wire at the same time. Duplex, or sending one message in each direction over the same wire at the same time, is in common use. Quadrúplex is not uncommon, and under the Rowland system it has four operators working over a wire from each end. The Phantoplex, a recent discovery being used by the Postal Telegraph Company, makes possible the combination of two duplex or multiplex systems over the same wire. As many as thirty-six simultaneous messages have been sent on one wire, but multiplex telegraphy to this extent has not yet been made commercially successful.

THE TELEGRAPH MONOPOLY AND RATES

A telegraph company is like the postal service in this way—to be at all satisfactory it must be practically universal. The public does not wish to go to one post-office to mail letters to San Francisco, and to another to mail letters to New Orleans. From the very nature of its business, a telegraph company looks toward monopoly. Practically all European telegraph systems are monopolies owned by the governments. In this country, the two great companies have wires covering practically the whole of the United States. The Western Union, by far the larger, was formed by the amalgamation of several small companies in the Middle West. By 1863 it had absorbed practically all the lines north of the Ohio River and west of the Mississippi. Other mergers and absorptions followed till in 1881 it was almost a complete monopoly. Five years later, Mr. Mackay got control of some small companies and combined them into the Postal Telegraph Company to work in harmony with the Commercial Cable Company. Since that time there has been a continual extension until the Postal Telegraph wires reach all the more important points in the United States.

Because, perhaps, of this competition and of the great growth of the telephone, the receipts of the Western Union have been stationary for the last four years. The Postal Telegraph Company's receipts have increased somewhat, but the business as a whole is suffering under what the Census Bureau characterizes as arrested development. The criticism has often been made that the use of the telegraph in the United States has been restricted because the tolls are too high—that it might be popularized and greatly extended in use by fixing rates approximately as low as they are in some European countries; for instance, you can send a twelve-word message anywhere in the United Kingdom for twelve cents; and the English send twice as many messages per capita as we send. On the other hand, the companies maintain that the cost of covering so wide a territory prevents radical reductions, and they point to the reductions that have been made, as shown by this table of rates from New York:

	1865	1891
Atlanta	$3.25	$ .50
Boston	.65	.25
Chicago	2.05	.45
Denver	7.00	.75
Galveston	5.50	.75
Portland, Oregon	10.20	1.00
San Francisco	7.45	1.00
Santa Fé	10.50	.75
Washington, D. C.	.75	.25

Since 1891 the rates have remained the same. In 1905 the average rate per message was 31.6 cents. The American companies have almost 1,500,000 miles of wire in operation for the sending of about 90,000,000 messages a year, or an average of about sixty messages for every mile of wire, while in England there are more than 150 messages per mile of wire. In spite of the lack of density in population, long distances to be covered, and the resulting high rates, the per capita use of the telegraph in this country is about as high as it is in Germany and France. There is no question, however, that the duplication of plant by the two rival companies is more costly than one single complete system would be, and it seems that although the public may derive some benefit by the competition in service, it does not in rates. The charges of both companies are practically identical, and the secretary of the Western Union said that the competition of the Postal

Company had no effect whatsoever on the reduction of rates by his company.

THE TELEGRAPH'S WHOLESALE BUSINESS

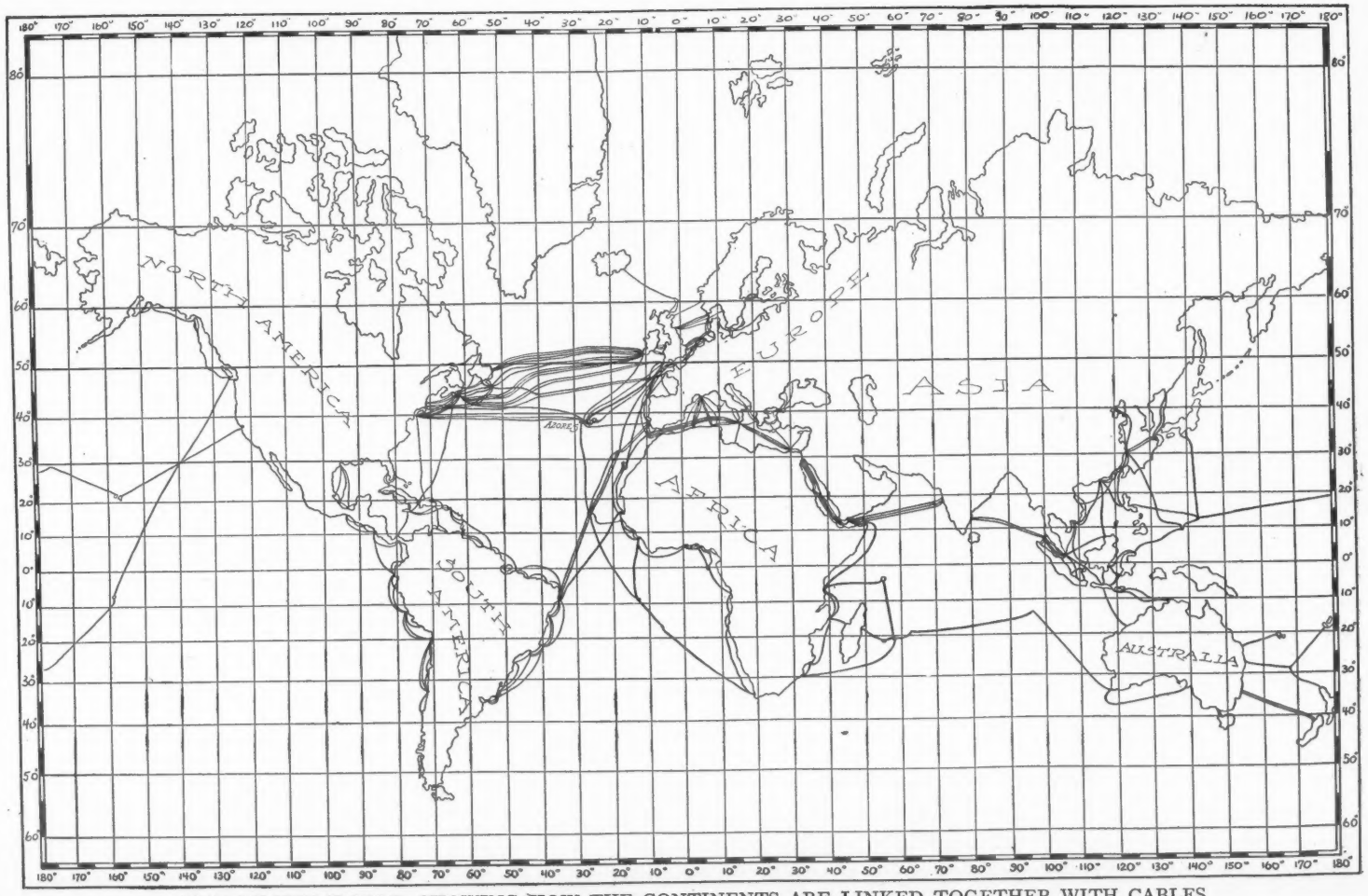
But whether the companies have developed the business of the general public well or not, what may be called the wholesale uses of the telegraph are more in use in this country than in any other. One of these is the use made by Wall Street. Private wires of brokers cost about $4,000 a year between New York and Boston, and about $25,000 between New York and Chicago. The American Telephone and Telegraph Company has taken much of the business from the two telegraph companies. From this company some brokers lease a combination telephone and telegraph line. During rush hours the abbreviated dialect of "the street" is telegraphed, for the telegraph for short messages is about as quick as the telephone, and far more accurate. When the rush is over and details and explanations are in order, the telephone connections are used over the same wires. Practically every broker's office has a ticker, a little machine in a glass case which automatically punches on a strip of paper the news that comes over the wire. The Stock Exchange maintains a service of this kind for its members, and in one year sent out more than thirteen million impressions. Two financial papers in New York maintain similar services for the transmission of general financial news. When the Southern Pacific Railroad Company declared its famous dividend during the past summer, the tickers announced it in hundreds of offices within sixty seconds after it was given out. One reporter had gotten the news. At the nearest telephone, another had telephone connection with his news office ready. At the news office they had already sent over the ticker wires the name of the company and the word "dividend." As soon as the all-important figure reached the office, it was sent out; hundreds of tickers completed the announcement. Within a minute after many a directors' meeting, their action is spread throughout a whole district. In another minute it is in Chicago, and the tickers there are spreading it. The decision by the United States Court in the famous Northern Securities case was announced at just one o'clock in St. Paul, Minn. A reporter sat at an open telephone in the court room and telephoned to a banking house which had a private telegraph wire to Chicago. There the message was repeated to a banking house in New York, and telephoned thence to the *Wall Street Journal*. The two words, "Government wins" were printed on the tape all over the financial district within two minutes after the decision was announced in St. Paul, some 1,500 miles away. The stock of the Northern Securities Company fell six points between sales. So quick is this service that men reporting for it by telephone have seen the first part of their message appear on the ticker before they could give the last of it.

The service of the newspapers is another wholesale use of the telegraph. Every large newspaper office receives telegraphic news from all over the United States, and their correspondents can get a direct wire to their office at any time. Most telegraphic news comes over wires leased to the Associated Press. These wires cover the whole country, and at central points are offices where the news is collected and rearranged in a form suitable to the section to which it is destined. All day and all night, year in and year out, the "A. P." dispatches are started from every section of the United States for every other section, and as they go almost automatically they assume the size and shape best suited to the locality to which they are going. By this endless system, foreign news from the "A. P." correspondents in other parts of the world is received and disseminated. The large newspapers receive their messages off wires almost alongside the presses that print it. The press rates in general are little over one-fifth of the regular commercial rates in the daytime and half of that at night.

Perhaps the greatest users of the telegraph are the railway companies. The use of the telegraph has made "phantom" railroad tracks also, for without it it would be impossible to run the number of trains that now go, particularly over the single-track roads.

CABLING AROUND THE WORLD

President Roosevelt opened the Pacific Cable with a message around the world. It went from Oyster Bay to San Francisco by telegraph, over the new cable to Honolulu, Guam, and Manila; by the old Spanish cable from Manila to Hong Kong; then around southern Asia via Saigon, Singapore, Bombay, to Aden and Suez, and via Gibraltar and Lisbon to the Azores. From the Azores back to America, it was taken up again by the Commercial Cable Company lines. The mes-



MAP OF THE WORLD, SHOWING HOW THE CONTINENTS ARE LINKED TOGETHER WITH CABLES

sage took nine minutes from Oyster Bay to Oyster Bay. There is hardly a country in the world that cannot be reached by cable. A message can be sent from New York to Abyssinia for eighty cents a word, and for the same price to Beloochistan; to Bokhara, Central Asia, for fifty cents and to German East Africa for $1.01. There are cables to Iceland and to Cape Town, South Africa. The Commercial Cable Company, which is the largest American company, will accept messages for Mecca, the Fiji Islands, Siam, and every other place that you ever heard of, and some that you have not. It controls about 30,000 miles of cable, which is about one-ninth of all the cable mileage in the world.

THE MIRACLE OF THE WIRELESS

The first cable across the Atlantic was laid in 1858 and now—less than fifty years later—Dr. Alexander Graham Bell predicts that the wonder of its age will be rendered obsolete by wireless telegraphy. But the wireless does more than send messages across the water. Mr. Walter Wellman expects to keep his Arctic exploring balloon, scheduled to start next summer, in touch with the world by wireless telegraphy. The traveler on the ocean liner reads his morning paper aboard ship, for before the vessel is out of communication with South Wellfleet, Mass., it begins to receive messages from the high-power station at Poldhu, England. A man in mid-Atlantic may find out within an hour or so about his family in Kalamazoo, Brussels, or any other place where they may be. Nor are such messages particularly costly. A ten-word message forty hours out from New York costs $3.00, plus the forwarding charge of the wire companies on shore; to vessels more than forty hours out, the charge is $5.00. The public is taking advantage of this new opportunity. For the first six months the receipts of the Marconi Company in this country were 88 per cent. more than for a similar period last year. But so far, its most important work has not been commercial service for the general public but the work—which really benefits it more—of lessening the dangers of the sea. As long ago as 1901 the Borkum Riff lightship, off the German coast, summoned help by the wireless when she was being driven out to sea in a heavy gale. Such things as the following, taken from the *Carmania* edition of the *Cunard Daily Bulletin* for August 31, 1906, are of frequent occurrence:

> "At a quarter to eleven o'clock this morning, exchanged signals with the S. S. *Manica*, of London, bearing north 4° west, distant one mile; stopped. She signalled 'not under command' (machinery out of order) and desired to be reported to Lloyd's. We immediately called up Sable Island wireless station, and through that point asked our agent in New York to notify Lloyd's of the mishap."

The Red Star liner *Kroonland*, with her stearing gear disabled 130 miles west of Fastnet, reported her accident by wireless and in less than an hour and a half received word from her owners. Many passengers sent messages ashore to relieve any anxiety that might arise from the delay. The *New York*, stranded on Cape La Hague, and the *Friesland*, with a broken propeller shaft, were both reported by wireless. It has become recognized in the service of the navy also. Five hundred of the English war vessels are equipped with Marconi instruments. In the campaign before the battle of the Sea of Japan, Admiral Togo used the wireless to great advantage in controlling his squadron.

The United States Navy has many of its ships equipped with the wireless apparatus, and has, besides, thirty-nine shore stations. The four high-power stations at Colon, Panama, Guantanamo, Cuba, San Juan, P. R., and Key West, Fla., give our navy a means of communication which would have been invaluable at the time our cruisers were hunting Admiral Cervera's fleet in the West Indies. The navy has also stations at Honolulu, Guam, and at the Cavite Arsenal, Manila. Most of its shore stations are equipped with the apparatus of the De Forest Company. This system is in operation all up and down the Atlantic seaboard from Quebec to Rio de Janeiro. The Standard Oil Company's vessels, the Mallory, Savannah, and quite a number of coastwise lines also, are equipped with De Forest instruments. They, too, do commercial business. One of their offices on a steamer coming up from Panama sent about $100 worth of messages for the passengers. But, as yet, the chief value of the system is the protection it affords. Coastwise vessels need no longer ever be out of reach of the storm signals of the Weather Bureau, and notice of a storm off such a place as Cape Hatteras is of inestimable value. The United Fruit Company saved $2,600 in one day on a cargo of fruit through

wireless connection with Port Limon, Costa Rica, and Bocas del Toro, Panama. Perhaps the most novel use of the wireless was that made by the Panama Railroad steamship *Allianca.* On March 14th, when the steamer was some distance out from the Isthmus, a stowaway was discovered on board. The *Allianca* telegraphed the fact to her sister ship, the *Colon,* going south. The steamers met, the tramp was transferred in a small boat, and taken in the *Colon* back to Panama.

Wireless has been of considerable service to the press on land as well as to the steamer papers. The last international yacht races and some of the English races were reported by wireless. The *London Times* press-boat *Heimun,* equipped with the De Forest system, was very successful in sending news to the station at Wei Hei Wei, on the Chinese coast, until the Russians summarily forbade further operation. The Key West *Inter-Ocean* receives its Havana news by wireless and the Nome *Nugget* gets all its national and foreign news this way. It prints on a Tuesday morning in Nome the happenings in New York on Monday, but to get a copy of the paper from Nome to New York takes three months.

Marconi was the first to achieve commercial success with wireless telegraphy. His invention is none the less great because it is the result of the successive labors of many generations combined, and added to by his own. Three days before Christmas, in 1902, he sent a wireless message across the Atlantic. As an experiment it was a success, but so far it has gone no farther than that stage. Both companies, however, now promise a transatlantic service in the near future.

THE TWO SYSTEMS

Besides their stations on the coast, the De Forest Company has offices at such inland towns as St. Louis, Cleveland, Kansas City, Fort Worth, Milwaukee, Denver, and Chicago. In this country the Marconi Company has no inland stations, but on the coast of Europe it has them scattered about in Italy, Norway, Sweden, Holland, Australia, Denmark, and England; and over the rest of the world in Iceland, the Dutch East Indies, India, China, Mexico, Brazil, Chili, the Argentine, Uruguay, Ecuador, and Panama. The stations in England communicate overland across France and Spain to Gibraltar without any trouble. Within the last year, the Russian Government has become frightened lest in some of the peasant uprisings the wires to St. Petersburg and Moscow should be cut and these cities isolated. To guard against this, wireless stations have been set up there and on the frontier. In Siberia, at points along the Amur River and at Vladivostok, they have put in the Marconi system in preference to poles and wires. Similarly, the wireless system took the place of the cable between the Scilly Isles and England two years ago when the cable broke. In the Japanese war some use was made of the new telegraphy by the Russian army. Our own and various European signals corps are using it, and the days when a successful cavalry raid in the rear of an army can cut its communications are passing. In war and peace, wireless telegraphy has fully demonstrated its usefulness. It has joined the great army of inventions which are constantly increasing man's effectiveness.

THE UNITED STATES SIGNAL SERVICE

The Government is one of the largest users of the telegraph. On the firing lines of our forces in Cuba were the Signal Corps men with their telegraph lines. As they moved forward they left a trail of insulated wire along the ground behind them. These were the beginnings of the present telegraph system in Cuba. In the Philippines, the same thing happened. Wherever the army went, telegraph lines followed. A company of the Signal Corps, with its wagons and reel carts, has material to build one hundred miles of telegraph line on light poles and sixty more miles of ground wires, and the latter can be laid as rapidly as a horse can trot. The telegraph makes "phantom" men as well as "phantom" rails. General McArthur said that without the Signal Corps telegraphic service, it would have been necessary to have had 150,000 men in the islands instead of 60,000. And this service has been performed as well, if not better, than any similar work for any army in the world. Official messages on land have had an average cost of five mills per word and over the cables of three cents per word. The charges for commercial messages are two cents a word for messages on the island of origin and four cents for points outside. The receipts from the traffic are about $100,000. Up to 1904, the Signal Corps had built something over 10,000 miles of line at a cost of $2,500,000, or $2,500 a mile, including materials, construction, and

maintenance. It had also built a telephone system in Manila.

The Signal Corps has a cable-land telegraph-wireless route from Seattle Wash., to Nome, Alaska. The cables, built according to the specifications of the Signal Corps officers, of rubber instead of the usual gutta-percha, were cheaper and have been 25 per cent. better conductors than the usual kind. From Seattle to Nome, 1,700 miles by cable, 1,100 miles by land telegraph, and 107 miles by wireless, a ten-word commercial message costs $3.80 and a similar press message 30 cents. It is over this line that the Nome *Nugget* gets its news of the world. Although the average rate is higher between some points in Alaska, such as Kitchumstock and Tanana Crossing, the charge is twenty cents, or five cents less than the lowest charge of the companies in the United Sates. The receipts from this service are about $240,000 a year.

Every year the people of the United States pay about $1,500,000 for the Weather Bureau service, or about 1½ cents per capita for the privilege of seeing in the paper whether it is going to rain or not. That is what the Weather Bureau service means to some people, but not to all. For example, during the cold wave of 1898, fruit growers were enabled to save $3,400,000 worth of fruit by the warnings sent out by the Weather Bureau. In the Middle West, 600,000 farmers receive the weather forecasts by telephone within half an hour after they are telegraphed from Washington. Three months ago, when the hurricane struck New Orleans, it did not catch a single vessel leaving port. They had been notified by the Weather Bureau. Within an hour after it is decided in Washington from the telegraphic reports that a storm is coming, the captain of every vessel in lake or ocean port in the United States has notice of it, coastwise vessels are warned by storm signals, and far to sea the news is spread by wireless. On the Great Lakes, the Weather Bureau service has caused a decrease of 66 per cent. in the loss of shipping due to storms. The thousands of coal barges that float down the river from Pittsburg have to wait for high water to make the passage. The Weather Bureau gives the owners notice when the floods are expected and they load up and are in readiness when the high water comes.

At eight o'clock every morning and evening, from far up in the Canadian Northwest, from stations in Mexico and the West Indies, and from cities all over the United States, the telegraph wires are carrying the reports of local conditions. By nine they are all in Washington. An hour later the official forecast is ready, and by eleven o'clock you may see the day's weather map, made from this data, hanging on the walls of the office. The forecasts have been telegraphed all over the country. The reports from the local stations come in in a certain sequence so that the sender of each report is known without any signature or address being on the message. The reports are in cipher which enables them to say in five words what used to require twenty-four. Most of this telegraph service is done by contract with the telegraph companies, but in some places the Weather Bureau has had to build lines of its own. One of these runs from Norfolk, Va., to Hatteras Inlet, along the sands separating Albemarle and Pamlico Sounds from the Atlantic. The poles have to be sunk in cylinders because holes cannot be dug in the sand. Even after they are planted the poles are often dislodged by the tide soaking through the sand. Chief Robinson, of the telegraph division, was caught once on a sand dune along this line by a furious northeaster. Before the storm abated, the mound on which he stood had been almost washed away. He had seen great fifteen-foot waves from the Sound roll over the sand bars, uproot the telegraph poles, tear them loose from the wire, and carry them off to sea. But the importance of this Hatteras line is as great as the difficulty of keeping it up. It connects the life saving stations every five miles along this awful beach, and the storm warnings it supplies and those forwarded from its terminal by wireless to the Diamond Shoals lightship have lessened the dangers of the worst coast in America. Another of the Weather Bureau lines runs from Port Crescent, Washington, to Tatoosh Island, partly through an almost impenetrable forest, and then across a strait to Tatoosh Island. The tide in the strait was so strong that it rolled stones over the bottom in such a way as to prevent the use of a cable. The difficulty was solved by using one span of wire two-thirds of a mile long (the longest telegraph span in the world), stretched from high towers on either side of the strait. It was strung parallel with the prevailing high winds, and in the five years of its service has broken but once.

In war ashore and at sea, in commerce by rail and water, in growing crops, reporting them and speculating in them, from spreading news to telling the time of day, the telegraph is an integral part of the daily life of the world, and particularly of America.

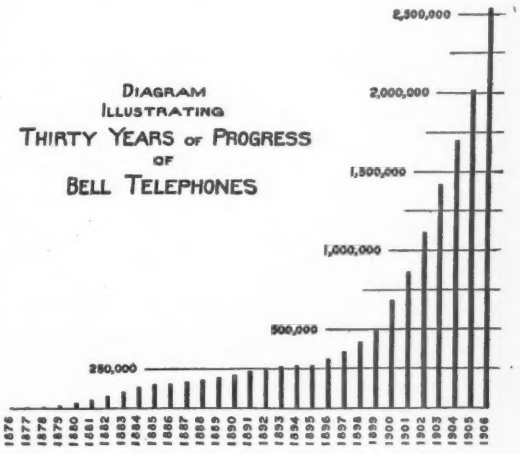
AMERICAN TELEPHONE SUPREMACY

Yet the telephone, invented nearly fifty years later than the telegraph, carries at least seventy-five times as many messages. Last year was the thirtieth anniversary of Dr. Bell's discovery and one to every thirty-three people in the United States was a subscriber to the Bell telephone companies. There is now in either the Bell company or the independent companies probably one telephone subscriber to every eighteen people in the United States. In 1902 there were 5,070,554,553 telephone messages sent in this country—268,348,184 more than were sent by mail and telegraph combined; and, since that time, the telephone has grown more rapidly than either of the other methods of communication. It is peculiarly an American institution. New York City has more telephones than London, Glasgow, Liverpool, Manchester, Birmingham, Leeds, Sheffield, Bristol, and Belfast combined; more than France, Belgium, Holland, and Switzerland. The recent yearly increase in the number of telephones in New York City is equal to the total number in Russia. Yet there are many towns and cities in this country with a greater number of telephones in proportion to their population than New York. Before the earthquake, there was a telephone for every eight people in San Francisco, which is more than twice the ratio in New York. And Seattle, Washington, and Portland, Oregon, had even more in proportion to their population than San Francisco.

ODD USES OF THE TELEPHONE

There are, besides the regular commercial telephone companies with their town and city service and long distance connections, some 6,000 or 7,000 rural telephone lines in this country; and all of these are put to all kinds of uses. A man accused of shooting deer out of season in California pleaded guilty over the long-distance wire. The judge accepted the plea and fined him ten dollars. A will made by telephone was admitted to probate in Missouri. The Sioux on the Rosebud and Cheyenne Indian reservations have 320 instruments. There is one 14,280 feet above the sea, on Pike's Peak, and another 3,000 feet underground in a Michigan copper mine. The selectmen of Billerica, Mass., held their meeting in 1905 by telephone while the streets were blocked by a great snow storm. In the town of Solomon, Kansas, on the day of the funeral of a prominent man, a telephone line was run into the church and a megaphone was attached to the transmitter just in front of the preacher. The funeral sermon was heard along all the farmers' lines in the vicinity, as well as in the overcrowded church.

In Maine the telephone is used to protect valuable timber land from fire. The owners have built six mountain observatories and as



soon as the watchers locate a fire with their glasses the fire warden is notified by telephone. In 1905 the station on Squaw Mountain discovered thirty fires in time to prevent any considerable loss of timber; the observatory on Cittean Mountain gave notice of twelve fires, and that on Mt. Bigelow, of eleven more. Altogether, they saved about a million dollars' worth of timber. In sections where log drives are floated down the rivers on the spring freshets, telephone wires are strung along the banks of the stream. When a jam occurs, the drivers up the river are notified and the drives are held up until the jam is broken.

The telephone is as much of a business asset to the farmer as it is to city offices. Over it he gets the weather reports and market prices, calls the doctor, the fire brigade, or help in case of burglars, as the case may be. It saves the

farmer many times what it costs him. In some places there are telephone clubs of farmers' wives. At a certain hour every day the members all go to their telephones and chat over the wire. At the time of the San Francisco disaster, the American Telephone and Telegraph Company through its local company offered to distribute Governor Guild's appeal to the state of Massachusetts. The work was begun at 5.30 in the afternoon and before eleven the proper authorities in 353 cities and towns had received the message. The Illinois Central Railroad is using the telephone instead of the telegraph for train dispatching and it is used between the various life-saving stations along our coast. A packing house in Boston leases a wire to Omaha for a certain time every morning. This is perhaps the longest successful use of the telephone, for beyond 1,000 miles the mechanical difficulties increase very rapidly. In one hotel in New York there are 2,500 instruments and in a Philadelphia store, 2,000. Customers can talk from their houses with the clerks of any department, and even at night, after the store is closed, orders are received over the wires to be attended to the next morning.

The business done by the telephone is partly self-originating, but some of it has been taken from the post-office, the telegraph companies, the messenger boy service, the trolley and railroad lines. The officials of the New York, New Haven and Hartford Railroad say that its use has affected passenger traffic between New York, Boston, and the adjacent manufacturing towns. In other countries, these uses have been less developed. In the United Kingdom, in the beginning of 1905, there was one telephone for every 115 persons, in contrast to one for every 22 persons in this country. Sweden, the best telephone country of Europe, had one instrument for every 47 inhabitants, and Russia, the worst, one for every 2,250. In Germany and France, exclusive government ownership prevails. In England, by 1911, the Government will have acquired a monopoly, and the mail (including parcels post), telegraph, and telephone service will all be operated as one harmonious communication system. The telegraph and telephone service of the English Government at present is run at a loss and the same is true of the government telephone system of Switzerland. Sir William Preece, the head of the English system, and the chief of the French service both attribute part of this lack of financial success to the red tape and lack of adaptability of government operation. In America the telephone business has been profitable. The American Telephone and Telegraph Company, which controls more than half the business in the United States, recently increased the dividend on its stock to 8 per cent. The rest of the business, in the hands of the independent companies, has not been so profitable, although it is not run at a loss, except in a few instances.

TELEPHONE RATES

When the telephone was first introduced, it was customary to charge what is known as a flat rate; that is, a certain fixed sum a year for each instrument. But the business has so grown in size and complexity that there is no more a regular rate than there is a regular price for shoes. A farmer on a rural line who can talk with five or six neighbors up and down the road gets his telephone cheap. A business house in a city whose 'phone will connect with 150,000 others naturally pays more for it. In like manner, special rates and equipment have been devised for combinations of individual and party lines, hotel, department store, apartment house, private branch exchange service, prepayment coin boxes, public pay stations, farmer and ranch line service. The adaptability of the American companies in rates and service has been one of the chief causes of the tremendous growth of the business in this country. New York is a good example. Until 1894 the flat rate system was in use, under the following schedule:

Business direct line	$240	a year irrespective of the number of calls
" two-party line	150	
Residence direct line	180	
" two-party line	125	

This system was open to two objections. Those who used their telephones little had to pay equally with those who used them much. And it tended to increase greatly the number of calls on each telephone, but to limit the number of people who had telephones. In June, 1894, a system of rates based upon the number of times the telephone was used was put into operation, with the hope that it would widen the service and bring it within the reach of all classes. A part of the schedule was

Business direct line .....$150 for 1,000 local messages
Business party line .....$100 for 700 local messages

At various times during the next twelve years

these rates have been lowered. In 1905 a part of the schedule was

Business direct line:
$60 for 600 local messages and 6 cents for each extra message.
$231 for 5400 local messages and 5 cents for each extra local message.

On July 1, 1906, another reduction was made. To deal better with so large and complex a problem as supplying telephone service in greater New York, the city was divided into three districts. The rates were fixed at

$48 for 600 local messages and 5 cents for each extra message.
$219 for 5400 local messages and 4 cents for each extra message.

for a direct line to either business house or residence. This rate applies throughout the city. In sections which are small communities in themselves local rates are in force for calls within the particular area.

The pay-station rates have fallen from fifteen cents to ten and, in 1906, to five cents, except in hotels. The results of these changes were very marked. In 1889 there were 8,000 telephones in New York, or one to every 150 of the inhabitants. During the next five years, under the flat rate, there was a consistent slow growth which brought the ratio to one instrument to every 136 inhabitants and the number of telephones had grown from 8,000 to 11,054. By 1898, after the new rate scheme had been in effect four years, there were 31,474 telephones. Four years later, there were 93,301, or one to every 39 inhabitants, and on January 1, 1907, there is at least one to every 19 people in the city; and it must be remembered that these proportions show the increase of the telephone business over the very rapidly increasing population. The success of the telephone companies shows how eager the American public is for communication facilities and suggests that perhaps the telegraph companies, in spite of the disadvantages under which they work, have not taken full advantage of their opportunity to serve the most eager people in the world for rapid communication.

Proper maintenance and construction have been a harder problem in the telephone industry than in most others, because the growth has outrun all calculations and improvements have followed one another so fast that plants in perfectly good physical condition have to be discarded for improved ones. In New York, the system was practically rebuilt three times in sixteen years. In Baltimore, a plant which cost $2,100,000 replaced one which was only six years old. The first telephone lines imitated the telegraph systems in using iron wire as a conductor and the earth for the return circuit. Copper was found better adapted for telephone use, so it was substituted for the iron wires. So much trouble was experienced from the action of other electric currents on wires using the earth for the return circuit that, about 1890, metallic circuits were substituted, so that now every telephone line has two wires. In the cities they are generally wound in cables and laid in conduits under the streets; one cable sometimes holds as many as 600 pairs of wires. The first lines were, as many rural lines still are, arranged so that every subscriber could hear everything that passed over the line and no connections had to be made between different telephones. In New York City there are now switchboards so arranged that any one of the 260,000 telephones can be connected with any other, which means a number of combinations impossible to count. Switchboards of the largest type contain more than 2,000,000 separate parts and cost $300,000. Just the copper wire in the long distance circuit between New York and Boston cost more than $130,000.

THE TELEPHONE MONOPOLY

To keep the old plants up-to-date and build the new system demanded by the public calls for a tremendous amount of money. The American Telephone and Telegraph Co. borrowed in 1906 for the development of its business $80,000,000 (and $20,000,000 for the retirement of old bonds), which is expected to last only part way through 1908. Even for a profitable business in prosperous times, it is not easy to borrow money in such amounts. The independent companies, which are not as a rule as well off financially as the Bell system, have to borrow money on less favorable terms. The call for money will continue, for the telephone business is growing more rapidly than almost any other great industry in this country. Fifteen years ago it was thought that 3 per cent. would be the telephone using capacity of the population of the United States. Even in New York City at that time less than 1 per cent. of the population were telephone subscribers. The expansion of the industry led engineers to estimate it as high as 10 per

cent. This percentage has already been reached and passed in several Western cities. The engineers of the Bell systems are now planning all construction with a view to a 20 per cent. use of the telephone in the future.

Like the other news carriers, the post-office and the telegraph, the telephone business is logically a monopoly. Rival companies in a city may be used as convenient clubs to chastise each other, but the process is very inconvenient to the public. In cities where there is this competition, people are forced either to subscribe to both companies or to be content with access to only a part of the telephone users of the city. Not only is it inconvenient but the duplication of plants, officers, and employees makes it economically wasteful. What is true within city limits is true also of interurban traffic. A man in Washington does not wish to use one telephone in speaking to Baltimore, a second for Philadelphia, and a third for Richmond. Under such conditions, he would probably telegraph. But if the telephone on his desk will reach all three places, he is likely to use it. In 1905 there were about 118,522,000 toll line connections on the Bell system alone. Sooner or later, when the companies have caught up with the demand for more telephones, when the rapid growth is over and it is harder to get money for telephone companies, there will be a period of consolidation. A national telephone system is inevitable and a national telephone monopoly almost inevitable, for competing national systems would involve a greater economic waste and public inconvenience in the telephone than in the telegraph business. With the completion of this monopoly the choice between government regulation and government ownership is certain to arise. The Bell companies, even now, with lines in every state in the Union, form a national system, though by no means a complete one. Under Mr. Bryan's definition, they even maintain a monopoly, for they do more than half the telephone business of this country. Until 1893, when the original Bell patents expired, this system had almost a complete monopoly. At the end of the decade following, although the Bell system had about quadrupled in size, there were more than 4,000 independent companies in the field. Still, the older company maintained its lead, having in 1902 131.6 per cent. more miles of wire, 32 per cent. more telephones, and handling 54 per cent. more messages; nor are all of the independent systems rivals of the Bell, for some of them operate in sections where the larger corporation has so far been unwilling or unable to enter, and in some cases these lines have connections with the Bell systems. Since 1902, the Bell companies have prospered more than their rivals. The number of subscribers has more than doubled.

ODDITIES OF THE TELEPHONE

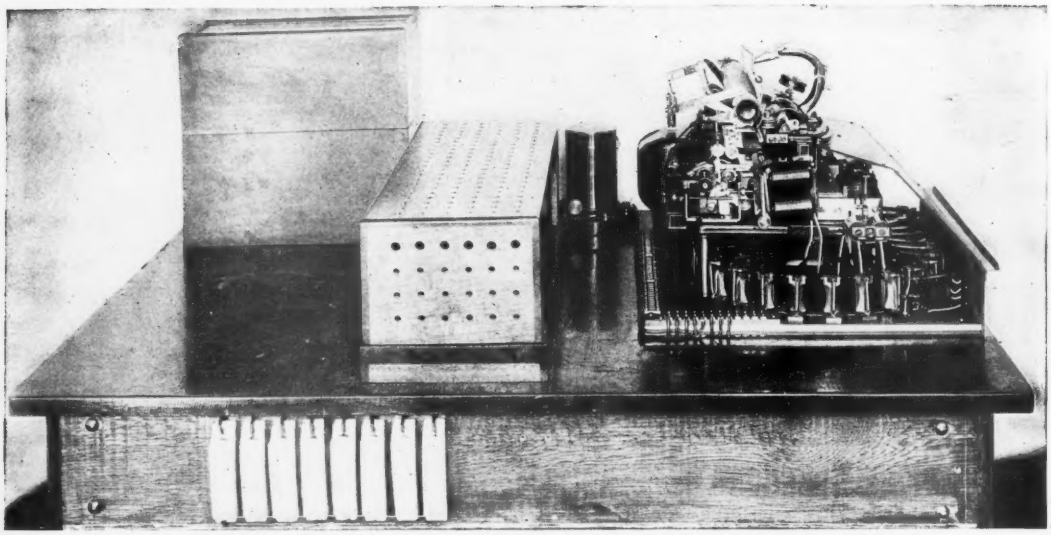
The results already achieved by the telephone are among the other wonders which by their very universality have become commonplace. The future opens still wider possibilities. Prof. Pupin, of Columbia University, more than five years ago discovered what is now known as the "Pupin coil," which preserves the vibrations over the wire and makes longer transmission possible. The Bell company bought this invention and it is in use on parts of their system. The telautograph, a more recent invention, will reproduce a written message in the handwriting of the writer. There is also a telephone of such sensitiveness that it will receive the voice of a person some feet away from it, transmit the message, and the instrument at the other end of the wire reproduces the message in the speaker's tone of voice. A young inventor in Newark announces the discovery of a wireless telephone. Whether all of these inventions come into general use or not, they and many others suggest such possibilities as talking around the world to yourself without even touching an instrument. Such a thing as this would not be so surprising to-day as the "talking toy" which Dr. Bell exhibited at the Philadelphia Centennial in 1876.

INVENTION OF THE TELEPHONE

Most inventions are either the culmination of many people's experiments or the result of accident. The discovery of the telephone was neither. With a remarkable knowledge of acoustics, but without any special knowledge of electricity, and with practically no data from previous experiments, Dr. Bell began work with the definite intention of inventing a telephone, and he had such confidence in his ability to do so that he gave up the position in Boston University on which his living depended. His invention was hardly noticed by the scientists at Philadelphia until the Emperor of Brazil showed an interest in it. From that Sunday morning until now, it has been one of

A WIRELESS TELEGRAPH STATION ON TOP OF A SKYSCRAPER

There are wireless stations in New York, Philadelphia, Chicago, St. Louis, Denver, and many other cities



RECEIVING MACHINE OF THE BARCLAY PRINTING TELEGRAPH

No attendant is necessary, except for collecting the messages from the typewriter

the discoveries which mark this as the age of invention. Nor was the Brazilian Emperor's trial of what has been dubbed "the speaking toy" the only dramatic incident of the discovery of the telephone. Almost simultaneous with Bell's patent, one was issued to Elisha Gray, of Chicago. The world had existed centuries and centuries without a thought of a

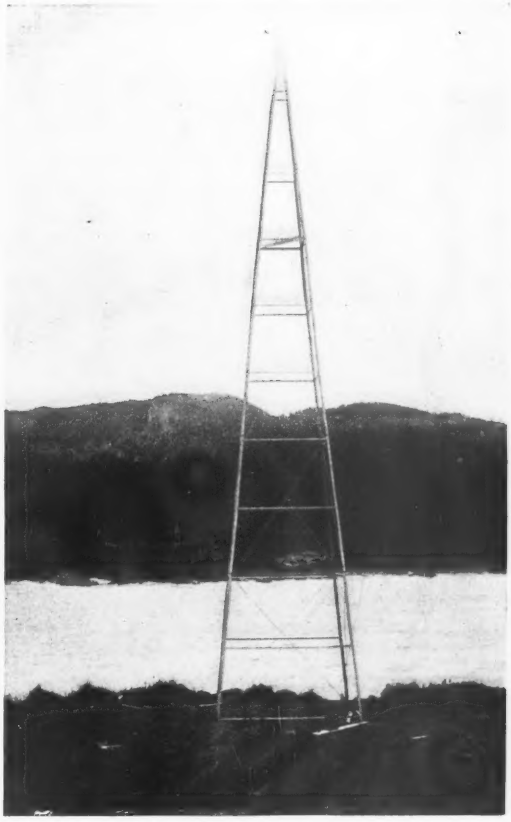
THE CAPTAIN OF A SEA-GOING TUG AT HIS WIRELESS INSTRUMENT

LAYING A TELEPHONE CABLE
Between San Francisco and Oakland

telephone. Within a few weeks, from absolutely distinct sources, two were brought forth. The Bell instrument was superior and in the long lawsuits that followed every court upheld the validity of his patent.

Men who saw the first telephone at the Centennial Exposition at Philadelphia in 1876 may reasonably expect before their allotted seventy years are gone to see a national telephone system with a telephone for every five people (the average family) and by which any subscriber may call up any other subscriber within a radius of a thousand miles. Perhaps, with improved conductors, a man may sit with his telephone and talk to practically any one he wishes anywhere in the United States, perhaps even around the world.

Many of the engineering problems in telegraphy and telephony are much the same. The American Telephone and Telegraph Company now does leased telegraph wire business as well as the two regular telegraph companies. The reason for this is that the wires can be used for telegraphing at the same time that they are being used to telephone; and being copper wires and kept in the repair necessary for telephoning, they are generally credited with being better for telegraphing than



THE LONGEST TELEGRAPH SPAN
It is on the U. S. Government line to Tatoosh Island, Washington

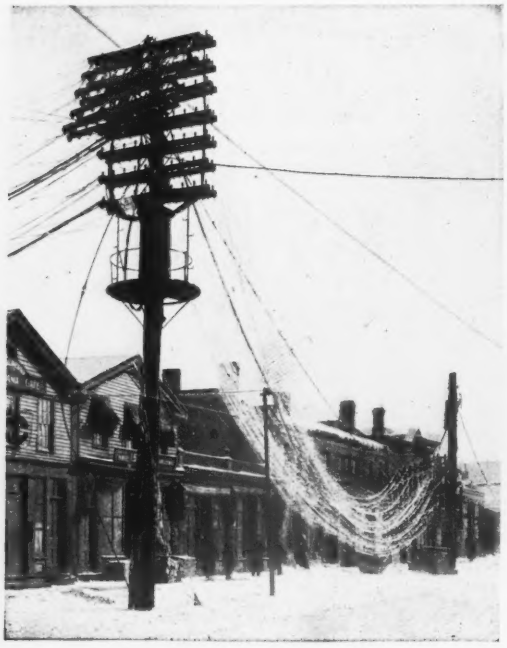
the regular leased telegraph wires. All over Europe, telegraphy and telephony are considered as parts of the same art and operated together. Telegrams are received and delivered by telephone. Such delivery is usually free and in some places a written copy of the message is sent for verification. In the early days of the telephone, the Western Union Company entered the field and was going to operate

SUSPENSION BRIDGE FOR TELEPHONE CABLES
Across the Connecticut River. The cables are too heavy to sustain their own weight

FLOATING TELEPHONE 300 FEET FROM SHORE
At Saltaire, Great Salt Lake

A TELEPHONE "CENTRAL" OFFICE AT WORK
There are 51 of these offices in New York City and through them any one of the 227,000 subscribers can be connected with any other

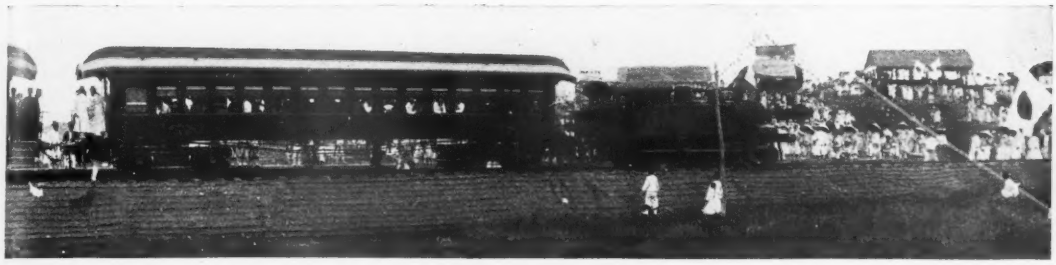
the two systems in conjunction. It was bought off by the Bell system in a famous agreement by which one company agreed to confine itself to telegraphy and the other to telephony. The agreement separated the two industries in this country, but that agreement expired some years ago. Those who saw the first telephone in Philadelphia may also live to see a national telegraph-telephone system of rapid communication extensive enough to reach every inhabitant of the United States and cheap enough to be used by everybody, and connected by telegraph and telephone cables and wireless with the rest of the world.



A POLE-LINE TELEPHONE AFTER A STORM
The broken wires show the superiority of the conduit system

TELEPHONE CONDUITS IN A CITY STREET
Showing single and multiple ducts

CEREMONIOUS OPENING OF A RAILROAD IN KOREA



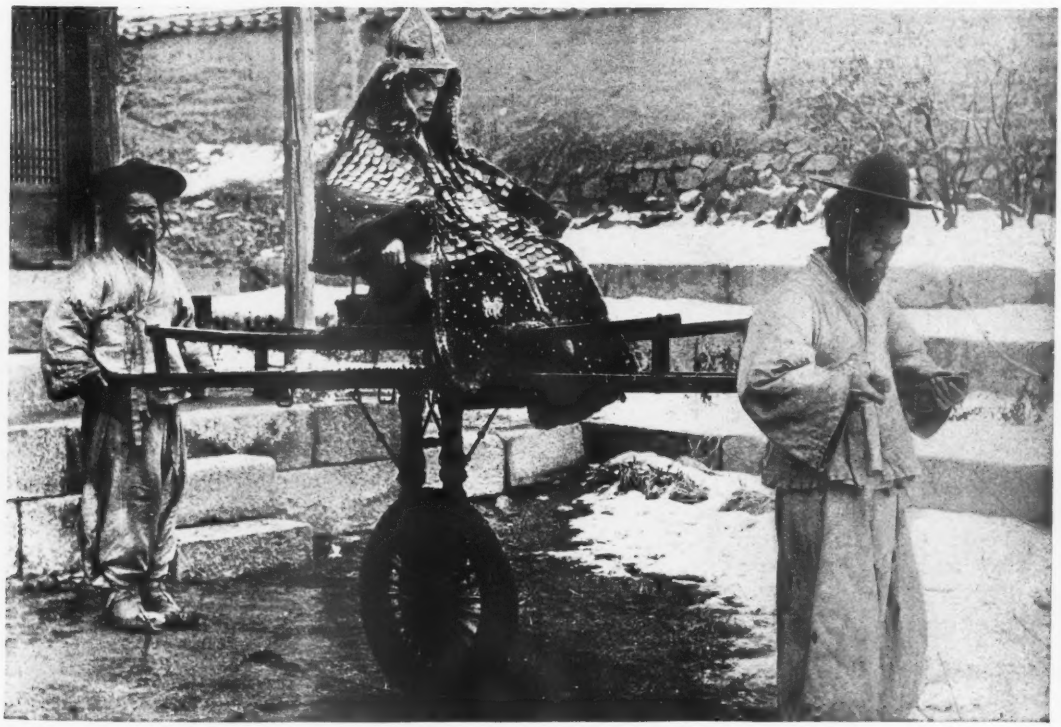
THE WORLD'S GREAT RAILROAD ENTERPRISES

BIG SCHEMES ON EVERY CONTINENT

BY

CYRUS C. ADAMS

AMONG the great railroad projects that have come into prominence in recent years, those which are in response to the most pressing economic needs are making the most rapid progress. Australia is the only exception. For reasons that will be mentioned, the trans-continental lines so essential to its development are still merely

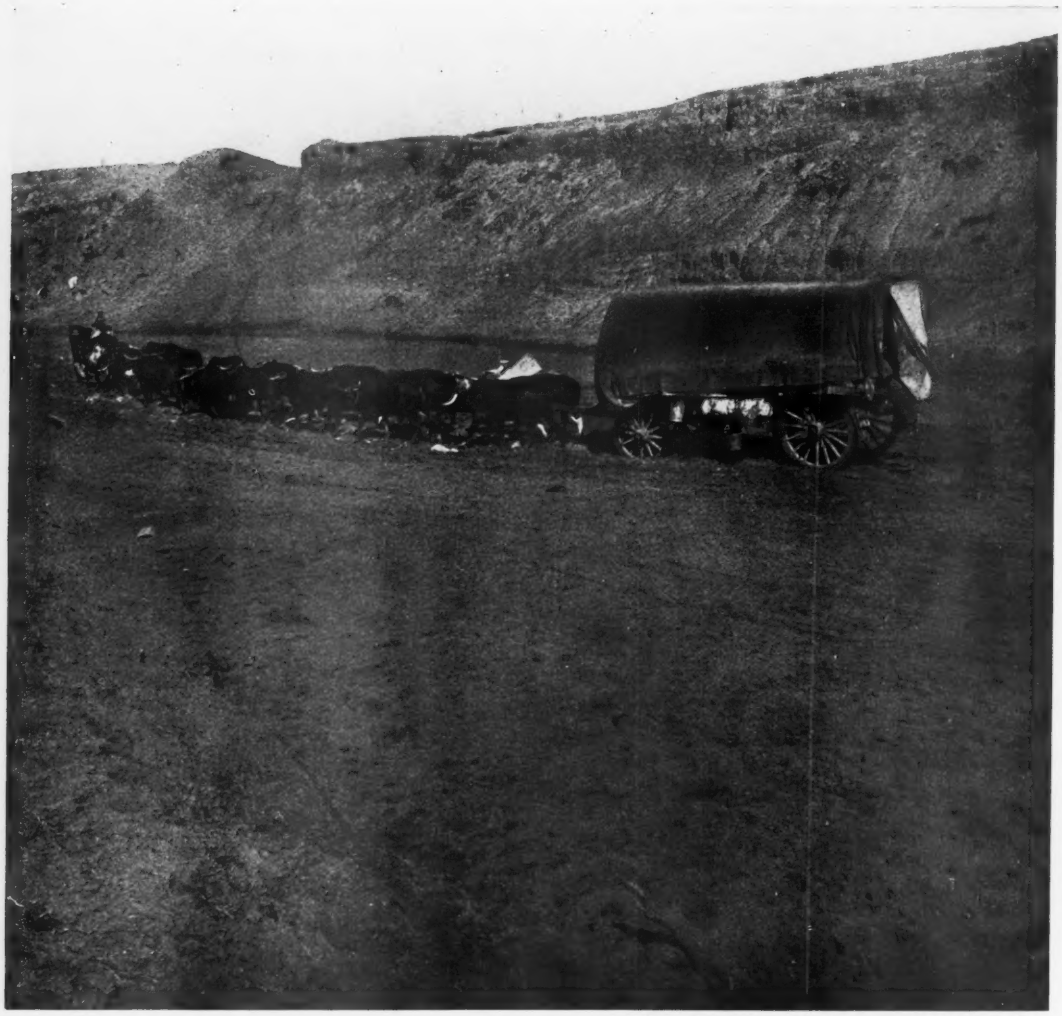


THE OLD WAY OF TRAVELING IN KOREA

projected. It is entirely different with one of the Asian and two of the African lines.

. . . . .

That imperial project, the Cape-to-Cairo Railroad, is steadily forging ahead—not because it is economically imperative that the Cape of Good Hope should be linked with the Mediterranean by a rail route some 5,600 miles long, but for the reason that many of the best opportunities for developing tropical Africa are found in the central regions nearly midway between the Atlantic and Indian Oceans. It is a condition preliminary to the opening and prosperity of these regions, on lines of modern enterprise, that they shall have transportation facilities from one region to another, as well as to the sea. To give only one or two illustrations among many—the copper mines of Katanga and the gold fields of northern Rhodesia must have more than the mining and smelting machinery, which might reach them by shorter land and water routes between the eastern and western oceans. They require the fuel of the great Wankie coal field, a little south of Victoria Falls. This coal must go north, as it is now moving south. They must have the better trained black labor of South Africa, which is already filtering north of the Zambesi in an increasing stream along the Cape-to-Cairo Railroad. British publicists are saying this



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THE "OVERLAND FREIGHT" ACROSS THE SOUTH AFRICAN VELDT

PART OF THE CAPE-TO-CAIRO RAILROAD UNDER CONSTRUCTION

year that the rich country of Uganda needs for its full awakening and widest opportunity not only the railroad that binds it with the Indian Ocean but also quick communications with the Anglo-Egyptian Soudan.

This is the hard business basis on which the Cape-to-Cairo project rests. The result is that we hear of trains running to-day to the Broken Hill mines of northern Rhodesia, 1,920 miles from Cape Town (about twice the rail distance from New York to Chicago), crossing the Zambesi River on a steel bridge that was built in five and a half months. The road builders are running a race with the Congo government to see which will first reach the mining district of Katanga, which is pronounced by experts to be one of the largest future sources of copper for the world's supply.

The Katanga line will be a branch of the main road. The route of the trunk line further north is problematical. Our map shows it as now projected to Uganda and down the Nile to the region of great swamps and overflowed lands which divert the route far to the east,

A CURIOUS OBSERVER
An ostrich at a window of a South African train

nearly to Abyssinia, whence it descends the Blue Nile to the terminus at Khartoum of the completed railroad to the Mediterranean.

Sir Charles Metcalfe, in charge of the work to Broken Hill, asserts that there will be no break in the all-rail route. His faith may ultimately be justified but it will not be surprising if, for some years to come, the long north and south waterways provided by the Tanganyika and Victoria Lakes, and possibly the Nile, canalized as far north as Lado, will form links in this splendid system of communication. The practical results will be the same, in either case.

Perhaps equally important for the development of equatorial Central Africa will be the Congo system of waterways and railroads. Eight years ago. the opening of the Matadi-Leopoldville Railroad, around the lower Congo rapids, placed Europe in touch with 7,000 miles of navigation in the upper Congo basin. The Congo Free State is now rapidly developing its great idea of extending uninterrupted steam communication between the mouth of

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A PACK-TRAIN ON THE MAIN HIGHWAY BETWEEN TWO CITIES IN ECUADOR

Courtesy of Collier's Weekly

SIX THOUSAND FEET ABOVE THE CARIBBEAN SEA

Scene on one of the railroads which are to make up the proposed Pan-American system

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THE ELEPHANT LIMITED

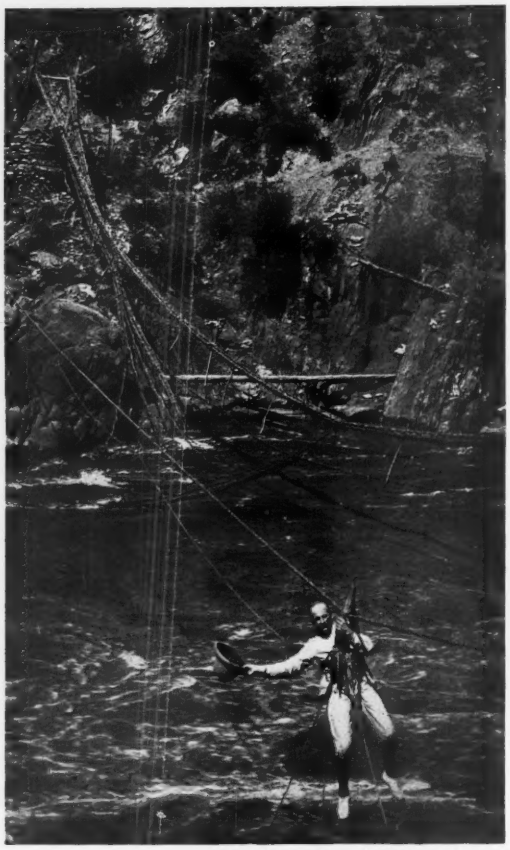
An Indian prince traveling in the style of ages past

the river and the head of navigation on its Lualaba head-stream. On Sept. 1st, the Stanleyville-Pontierville Railroad, seventy-fives miles long, was opened around the second stretch of rapids and two steamers were launched on the navigable waters above, adding 261 miles of river and rail transportation to the 1,325 miles already in operation between the mouth of the Congo and Stanley Falls. Before the line was fairly opened, a large force was already shaping the track-way for the third stretch of railroad from Kindu to Buli, 180 miles, beyond which point there is uninterrupted navigation for small steamers, 372 miles, to the head of navigation on the Lualaba. The Congo steam route will thus be about 2,144 miles long, of which 1,548 miles will be by water and 596 miles by land; and it will extend from the Atlantic into the extreme southeastern province of Katanga which, with its mineral resources, is the richest part of the Congo State.

THE RAILROAD BACKBONE OF CHINA

China's first trunk line, now nearly half completed, is one of the material expressions of the intellectual revolution in progress there. No evidence of the transformation of China is more convincing than the completed 753 miles of standard-gauge track between Peking and Hankow, traversing three of the most populous provinces, crossing about a hundred streams on steel bridges (one of which, over the Hoang River, is nearly 10,000 feet long), and equipped with 101 locomotives, 145 passenger coaches, and 2,200 freight cars in the opening year of the service. Construction began at the end of 1898; it was suspended for a year during the Boxer revolt, but was completed to Hankow in November, 1905. This part of the line was built with Belgian and French capital, under Belgian supervision, and the Chinese government guaranteed the payment of the bond issue.

Americans held the concession for building the section from Hankow to Canton, about 900 miles, and sent Engineer William Barclay Parsons, with a complete staff, to ascertain the physical and commercial aspects of the enterprise. The resulting survey was the longest



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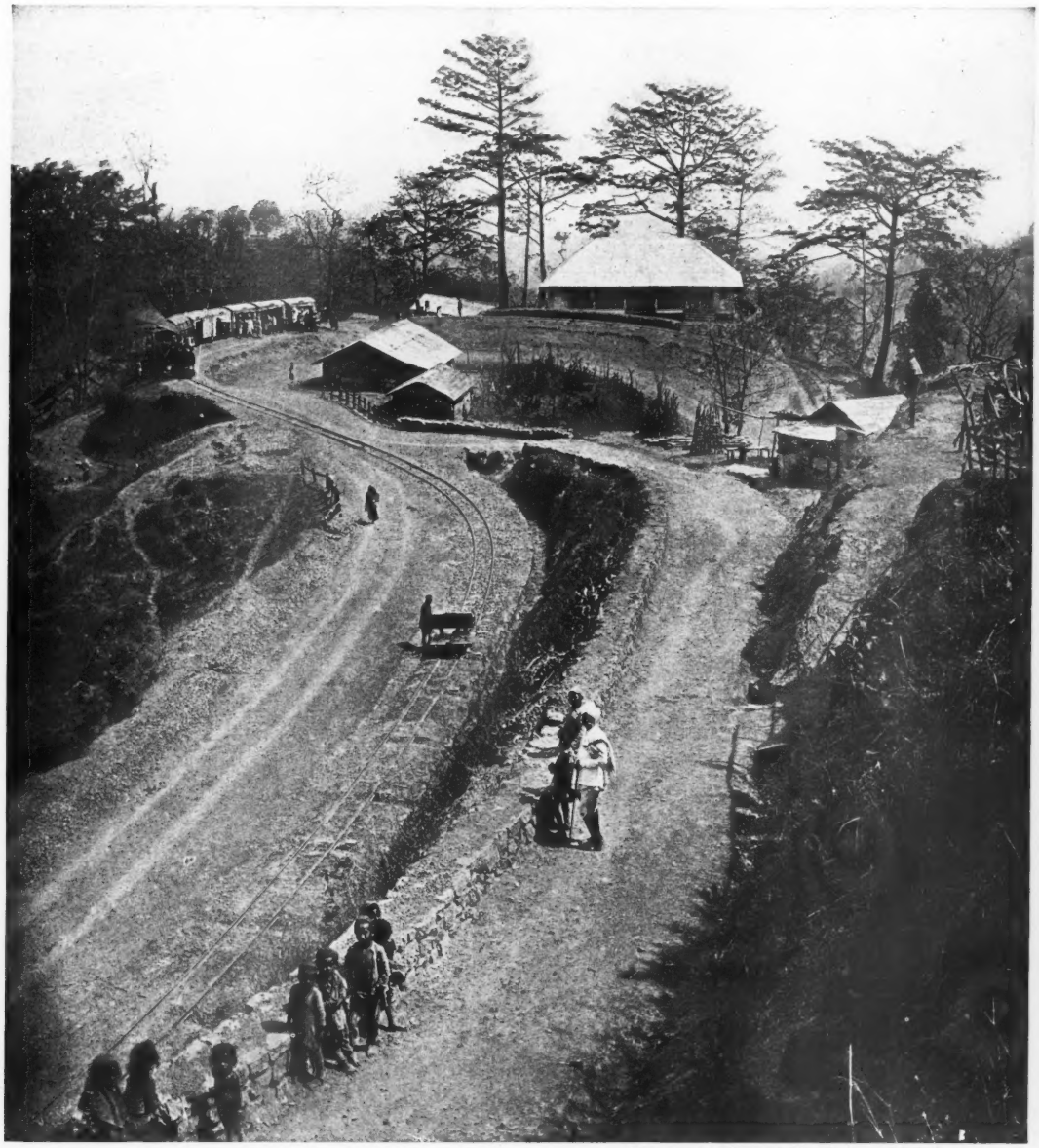
A RAW-HIDE BRIDGE IN INDIA

Over the Jhelum River

continuous instrumental measurement completed up to that time in China. In spite of his favorable report, the American syndicate did not go on with the work; its concession was solely under Chinese direction. When completed, this trunk line will be the backbone of the future railroad system of China. Its route is almost north and south between Can-



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HIGH-CASTE AND LOW-CASTE WATCHING A TRAIN IN INDIA

The train has just completed the famous double loop near Darjeeling

recalled, and the Chinese Government, greatly encouraged by the success of the Peking-Hankow road, began in March last the prolongation of the road south of the Yangtse ton, the greatest southern port, and Peking, the capital, connecting also Tien-Tsin, the greatest northern port, and passing through Hankow, the metropolis of the interior, at the

AN ESKIMO DOG TRAIN IN NORTHWEST CANADA

head of navigation for large ships on the Yangtse.

JOINING THE STATES OF AUSTRALIA

The Australian commonwealth needs nothing to consolidate its interests so much as railroads bringing all parts of the continent into closer communication with one another. Western Australia (with an area almost as great as the Western States exclusive of California), the largest source of Australian gold, has transportation to none of the other states excepting by sea. The Northern Territory of South Australia, a territory twice the equal of Texas, heart of the northern mining region. A railroad from Palmerston to Pine Creek, 145 miles long, is already in operation. When this project is carried out, Adelaide, on the south coast, will be connected with Palmerston by a continuous rail route 1,896 miles long, that is, longer than the Union Pacific from Kansas City to San Francisco.

New South Wales, with an area greater than our South Atlantic States, also wants connections with this rich northern territory. A line has been projected from Bourke to Palmerston which, if carried out, will link Sydney to the north coast by 2,247 miles of track,

A SNOW-PLOW HITTING A DRIFT IN THE NORTHWEST

abounding in the richest tropical and mineral resources, is reached to-day from the mother state of South Australia only by a sea voyage half-way around the continent. Thus transcontinental lines, running east and west and north and south, are urgently demanded. What is being done to meet the demand?

The government of South Australia has built a railroad north to Oodnadatta, to which point trains run once a fortnight. The legislature has authorized the extension of this railroad across the desert to Pine Creek, in the nearly as long as the Santa Fé from Chicago to Los Angeles.

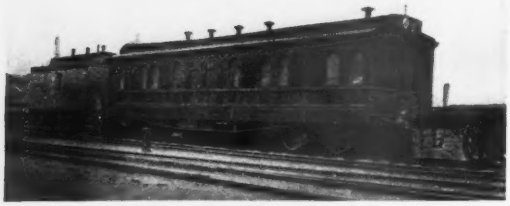
To relieve the isolation of Western Australia, it is proposed to build a railroad either along the coast to the port of Albany, or back of the coast to Calgoorlie. The demand for these latter railroads is becoming more insistent, yet two serious obstacles have prevented any actual development. Australia has relatively only a small population and there is fear that the building of these roads will impose upon the people greater burdens than they can carry. This difficulty is emphasized by

CONSTRUCTION WORK ON THE TRANS-SIBERIAN RAILROAD

The photograph also illustrates the impassability of the highways during the height of the winter season

the fact that the proposed railroads must be built almost wholly through desert and other unproductive regions. Australia has not yet found the solution, but it is not likely that the present inconvenient situation will continue many years.

The Pan-American Railroad is so colossal a project that it will be no reflection upon its importance though completion should be delayed for many years. The scientific studies along the route by engineering corps from 1892 to 1896 were valuable contributions to geography and economic geology; both Guatemala and Peru have used these studies in the actual building of links in the general system. It is now recognized that nowhere will the route encounter engineering difficulties greater than those which have already been surmounted in Mexico, Ecuador, and Peru. In brief, the project will advance no faster than the development of railroad enterprises in the various countries through which it will pass. Upon this development the Pan-American project depends for the links of the line, which ultimately will be welded into a continuous route.

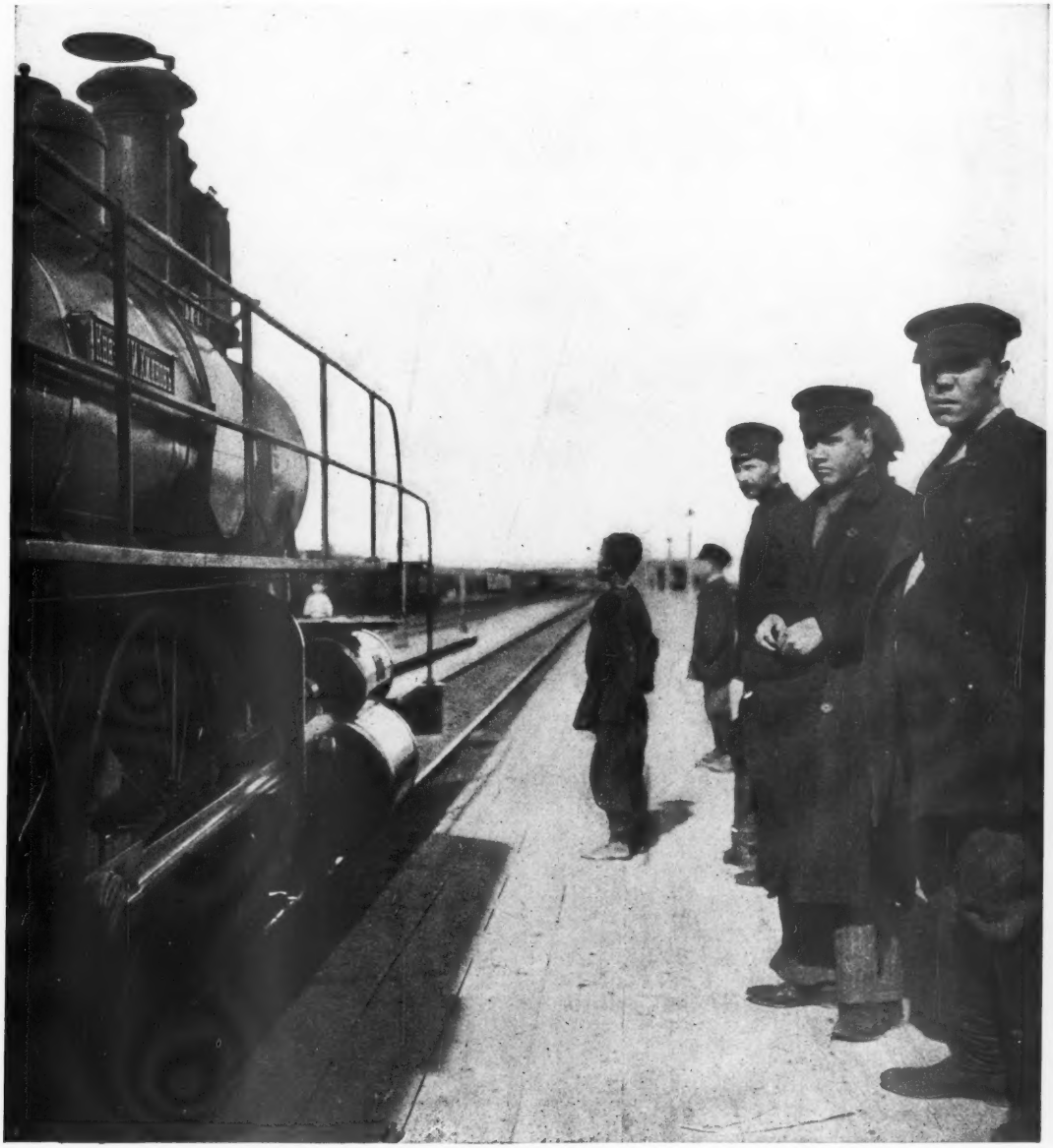


A CHAPEL-CAR IN SIBERIA

A coach fitted up as a church

There are a number of encouraging elements. Mexico has built a railroad to the edge of Guatemala and the Argentine Republic has extended lines north to Bolivia and beyond. Thus the terminal sections of the Pan-American line are already completed. Peru and some

other republics have established guarantee funds and other elements of a permanent railroad policy. Some advance has been made in the settlement of boundary disputes—causes of friction which have long retarded



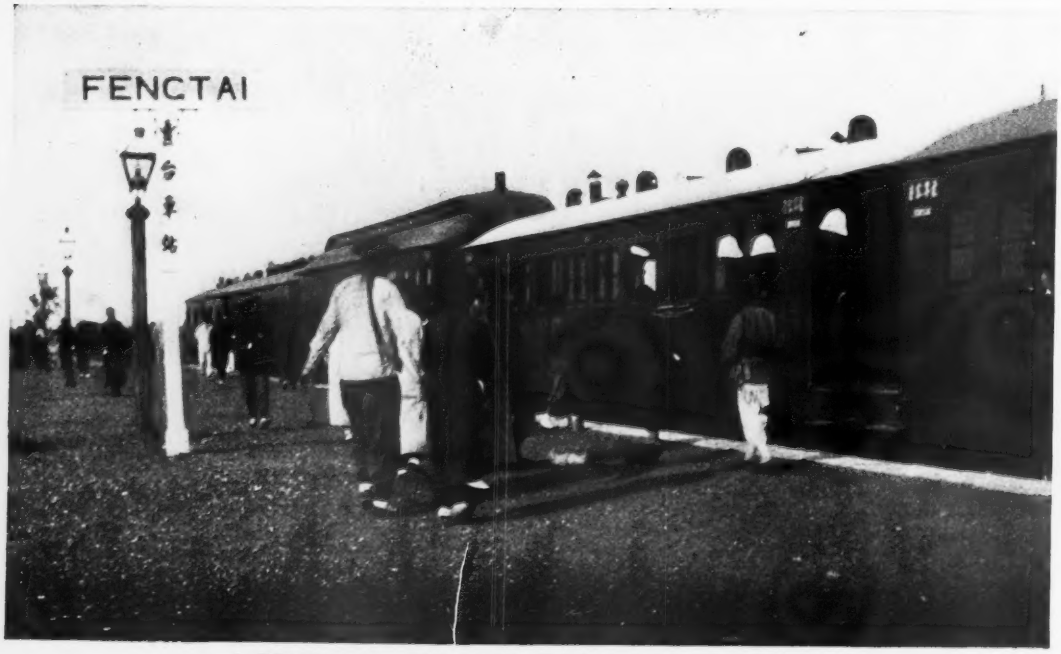
AN AMERICAN LOCOMOTIVE ON THE TRANS-SIBERIAN RAILROAD

railroad communications, and it is believed that the near completion of the trans-Andean Railroad and the definite plans for the Panama Canal will stimulate South American railroad building. Our map shows only the proposed main route but it is expected that the road will have important feeders.

It was estimated in 1896 that the length of the route between New York and Buenos Aires would be 10,471 miles, of which 6,703 miles were in operation, leaving 3,769 miles to be built. Since then, 460 miles have been constructed, leaving 3,309 miles still to be built.

Canada's project, which originated about

A DROMEDARY TRAIN FROM MANCHURIA IN THE STREETS OF PEKING



A STATION ON THE TIEN-TSIN-PEKING RAILROAD

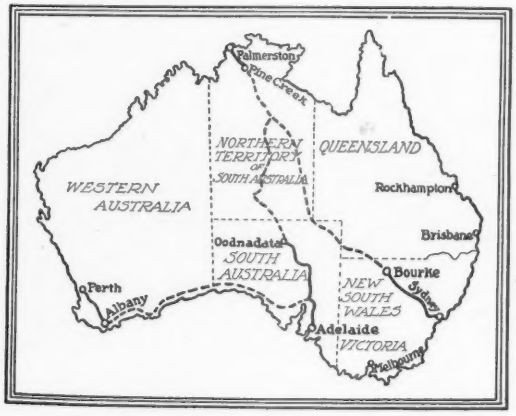
THE RAILROADS OF SIBERIA AND CHINA

The broken lines in the northeast show the two routes proposed for the Alaska-Siberian project

ROUTE OF THE CAPE-TO-CAIRO RAILROAD

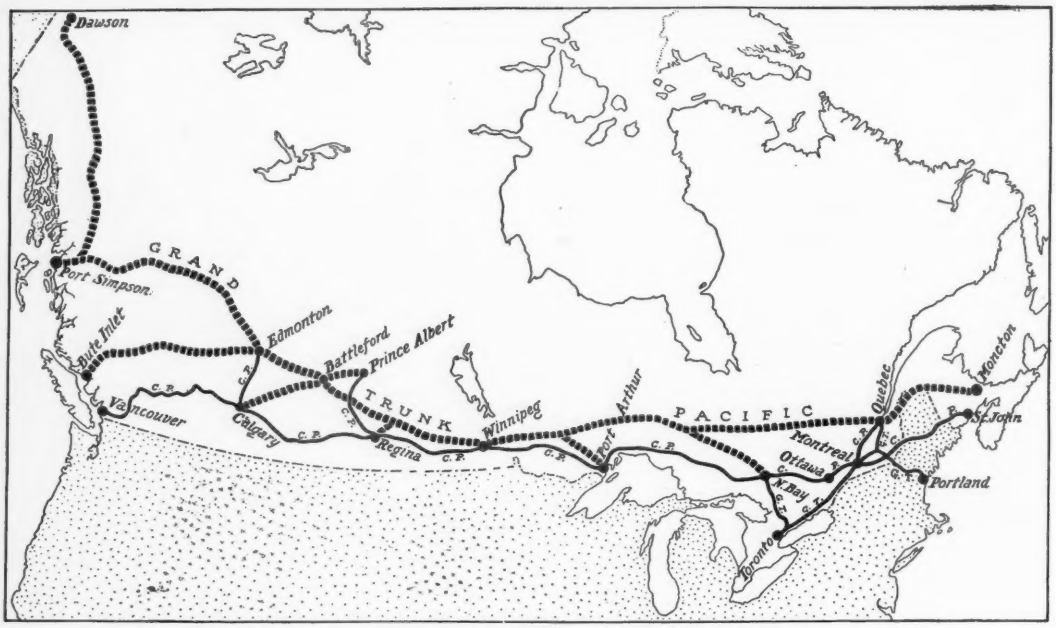
four years ago, of extending another railroad across the continent, will presently emerge from the stage of planning and survey. Probably a few years more will see added to the American trans-continental routes the Grand Trunk Pacific from Moncton, N. B., to extend through Quebec, Winnipeg, and Edmonton to Port Simpson on the Pacific Ocean—about 3,500 miles. Two years ago, the Dominion Government agreed to build the line from Moncton to Winnipeg, beyond which point the Grand Trunk Pacific Railroad Company, a new corporation formed by the Grand Trunk interests, engaged to carry it forward to Port Simpson and also to build a northern branch to Dawson in the Klondike.

The conspicuous feature of this enterprise which, it is estimated, will cost over $80,000,000, is that it will open to the farmer, lumber manufacturer, and miner a wide zone of territory north of the present limits of settlement. The wheat zone, the virgin forest, and the mineral deposits are found to extend far north of the new route and the pioneers of development will occupy the new region as soon as the essential transportation gives value to these fresh



THE RAILROADS OF AUSTRALIA

THE UNCOMPLETED PAN-AMERICAN RAILROAD



PROBABLE ROUTE OF THE GRAND TRUNK PACIFIC

The Canadian Pacific line is also shown

fields of enterprise. No other railroad project of the day gives promise of grander results in the opening of new regions to a large and prosperous population.

There is little to be said of the fantastic scheme of M. de Lobel for an inter-continental railroad between Alaska and Siberia by means of a tunnel under Bering Sea. The grandiose project has not made much impression excepting in some French and Russian circles. Many Russians have been disposed to regard it seriously, since their country would have much to gain by such a connection. A company has been formed in New Jersey with the avowed object of carrying out the project. The map shows the tentative route in northern Siberia and down the Lena to the Trans-Siberian road, as suggested by M. de Lobel, and the alternative route (believed by many Russian civil engineers to be preferable) following the Asian coast down to Vladivostok.

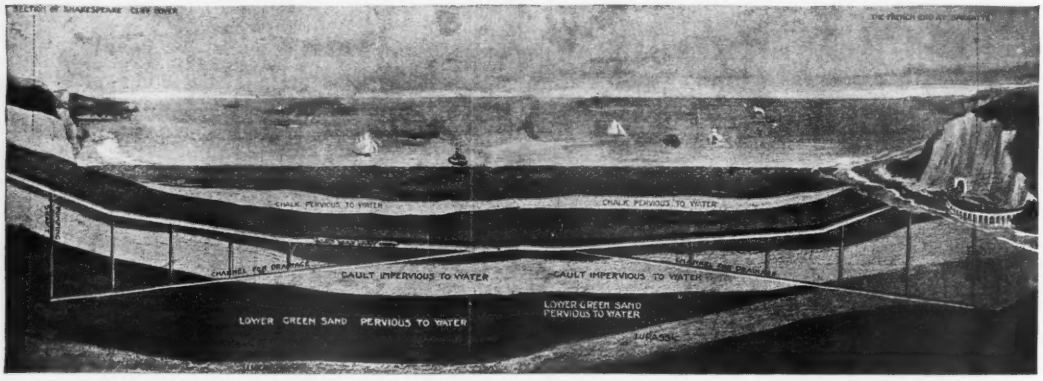

CHALK PERVIOUS TO WATER
CHALK PERVIOUS TO WATER
CHANNEL FOR DRAINAGE
FAULT IMPERVIOUS TO WATER
FAULT IMPERVIOUS TO WATER
LOWER GREEN SAND PERVIOUS TO WATER
LOWER GREEN SAND PERVIOUS TO WATER

DIAGRAM OF A TUNNEL OFTEN PROJECTED BETWEEN ENGLAND AND FRANCE

This transverse section shows the character of the channel bed

THE OVERLORDS OF RAILROAD TRAFFIC

THE SEVEN MEN WHO REIGN SUPREME

BY

C. M. KEYS

SEVEN men dominate the financial and railroad policies upon three-quarters of the railroad mileage of the United States. Every great highway of commerce lies within the control of one or another of them. So complete is their command of the main arteries of traffic that nine out of every ten tons of freight and nine out of every ten passengers that move upon the rails pay tribute to their wealth and power.

The men who rule these principalities are Messrs. J. P. Morgan, William K. Vanderbilt, Alexander J. Cassatt, George Jay Gould, James J. Hill, Edward H. Harriman, and William H. Moore. Not one of them rules alone. Each has with him friends, lieutenants, bankers, who strengthen his hands or execute his commands. Yet, so direct is the personal domination of these men that each may rightly be proclaimed the sovereign lord of his estate.

The word "control" does not by any means imply the ownership of more than half the stock of any road. Mr. James J. Hill never owned one-fifth of the stock of the Great Northern. Mr. Vanderbilt never owned one-fifth of the stock of the New York Central. Mr. Cassatt does not own one-tenth of the capital stock of the Pennsylvania. Mr. Harriman has not, in recent years, owned more than a small fraction of the stock of the Union Pacific Railroad. Yet no man will deny that these men have controlled, and do control to this day, each his separate empire.

THE INFLUENCE OF THE HOUSE OF MORGAN

The Morgan sway extends over twenty railroads, which own more than 35,000 miles of track. Yet Mr. Morgan is not a railroad man: he is a banker. His power of control over the affairs of railroads came to him as an incident to the reorganization of those railroads, as the fruit of that tremendous decade that saw the downfall and the reconstruction of nearly half the big systems of the United States. It is but a perquisite of the magnificent reign of the House of Morgan during that terrible period.

His influence is for peace—peace in finance, peace in management, peace upon the rails. He is against rate wars, invasions, needless hostility of any kind. In the reorganization of the Erie Railroad occurs a phrase that has become famous—"community of interests"—a phrase which Mr. Morgan still loves to dwell upon. His was the hand that brought about the famous "gentlemen's agreement," which ended the long duel between the Pennsylvania and the New York Central. His was the plan that made the "Anthracite Trust," so-called. By that diplomatic *tour de force* he made possible the Lackawanna, the Lehigh Valley, the Reading of to-day. He found them mere ragged, battered, disreputable gamins, fighting for crumbs of sustenance. He made of them gentlemen, clothed in purple and fine linen.

In this day, men are forgetting the Morgan of yesterday. The names of the younger men, and of that ever-youthful veteran of the North, J. J. Hill, are on the lips of every one. Men look upon the Union Pacific, with its 10 per cent. dividends, and upon the Great Northern, with its ever-lavish bounty to its stockholders, and marvel at the power and the brilliancy of the two great men who have brought these things about. Yet there is no other name that stands with the name of J. P. Morgan.

Shortly after Mr. Morgan had taken back the broken Dayton Road from the Erie, one of the seven men who rule the transportation world said this to me:

"Mr. Morgan is the biggest man this age has seen, and will continue the biggest until he leaves the world of activity of his own accord. The dollar looks smaller to him than the point

of a pin. We are like children, squabbling over trifles; like beggars, grubbing for pennies. Morgan is the measure of a man!"

Some historian of the future, delving into the records of this day, will probably write that the Morgan influence had almost entirely disappeared from the American railroad world by 1905. He will scan the records of railroad officials, and discover that Mr. Morgan held no important office at that date. He will find him a director of the New York Central, but will look in vain to find him in the Northern Pacific, the Erie, or the Southern Railway.

That is the Morgan way. Mr. Samuel Spencer could run the Southern Railway to his heart's content. Mr. Charles S. Mellen was master of the traffic destiny of the Northern Pacific. Mr. Frederick D. Underwood, under the Morgan hand, administered the affairs of the Erie Railroad according to his own ideas. In Morgan days on the Atchison, Topeka & Santa Fé, President Ripley was a free agent.

Mr. Morgan is a maker of men. He does not bother about details. He lays out a great, broad, sweeping, imperial policy for a railroad. He gives the railroad and the policy into the hands of a man of his own choice, and judges the man by the results. He took a Pennsylvania lawyer, gave him a litigious, troublesome, "flea-bitten" railroad to run, and lo—Mr. George F. Baer, to whom the rest of the world is so small a thing that he trips over it every now and again! He took a second vice-president of the New Haven and made of him Mr. Charles S. Mellen, the best president the Northern Pacific ever had. President Underwood of the Erie, one of the ablest of the trunk-line presidents, was second vice-president of the Baltimore & Ohio until Mr. Morgan gave him the Erie.

The influence of Mr. J. P. Morgan is the influence of the men that he has made. The historian must place on the credit side of his account the doings (but not, let us hope, the sayings) of Messrs. Baer, Mellen, Underwood, Spencer, Ripley, and many lesser men. When that is done, he may trace that mighty pacific influence from Boston Bay to the Golden Gate. He will find it making of the Erie a real trunk-line from lakes to sea, unravelling the tangled threads left over from the reign of pillage and rapine. He will find it making of the Southern Railway a fit highway for the growing commerce of the South, shoving new railroads into the long-neglected corners of Kentucky, Georgia, and Virginia. He may find it the dynamic force behind the new extensions of the crafty Santa Fé, creeping down toward the Gulf from western Texas, creeping up toward Oregon from San Francisco. He will find it telling the kings of the West what they shall do or shall not do with the great bankrupt terminals at Chicago. He will even find it hammering hard common sense into the Vanderbilts, reading the riot act to the wreckers of the Dayton road, gathering up the loose ends of the soft-coal situation, coaxing James J. Hill into some semblance of reason about his vast ore lands, and bridging over, at the last, the yawning gap that lay between that stiff old trader and the Steel Corporation.

For twenty-seven years Mr. Morgan has stood as a buttress of strength to the New York Central and its allied railroads.

VANDERBILT—THE RAILROAD ARISTOCRAT

Then, what of the Vanderbilts? Go up to the Grand Central Depot; go out to the big station on La Salle Street, Chicago. Go, if your patience will carry you so far, into the Vanderbilt offices at St. Louis, Cleveland, Cincinnati, Buffalo, Indianapolis. You will hear new names, new phrases, new ideas from the lips of the Vanderbilt forces. Two years ago there was division, confusion, weakness from one end of the Vanderbilt system to the other. Now, all this is changed. There is aggression, snap, vim in its management.

There are men now in charge of the New York Central Railroad. Two years ago, they were but shadows of a greater man, a man who seldom saw the system beyond the four walls of the Grand Central Depot, who spent half his time upon the highways of France, a gentleman of leisure—William K. Vanderbilt. Through many weary years, that blight of indolence lay upon the New York Central, the grandest of the trunk-lines. Big men broke their hearts trying to run that road. Traffic was stolen at every junction point. The Pennsylvania Railroad gathered in the Western New York and Pennsylvania, and the Baltimore & Ohio, took command of the bituminous coal traffic, girt Pittsburg tight about with coil on coil of unbreakable steel. Still the Vanderbilts moved not. The agreement by which peace came to the big trunk lines in 1899 was the beginning of the tremendous "Cassatt policy" on the Pennsylvania. To Mr. Vanderbilt, it seemed

but a fit opportunity to rest and enjoy the fruits of the rich season of life.

Men have accounted for the sudden change in many ways. Some say that Mr. E. H. Harriman and the Rockefellers took the road out of the feeble hands of Mr. Vanderbilt in the great panic. Yet others say that Mr. Morgan read the riot act to Mr. Vanderbilt in no uncertain terms, even threatening to cast the votes of the English stockholders against him in the elections. Certainly, the ownership of the New York Central stocks has seen great changes in the past four years. Even more important, the New York Central now has a fixed and determined policy—"To hold that we have and to make it sure forever!"

One of the factors that galvanized the New York Central into life was the rumor of a Pennsylvania tunnel under the North River, to bring the rails into New York City. The rumors of such a plan brought scoffs from the Grand Central Depot, but cable tolls went up with a rush. The actual announcement fell like a thunderbolt.

"Now," said one official to me, "it's hustle or hell for us!"

The Vanderbilts, whether of their own volition or by "persuasion," chose the former alternative. The shackles were struck from the hands of President Newman. Brilliant junior officials, like W. C. Brown of the Lake Shore and W. J. Wilgus of the engineering department of the New York Central, suddenly ceased to be figureheads. They had a lot of real work to do. The measure of the New York Central's progress since 1901 is the measure of the way they did it. The New York Central ceased to be a broad highway leading to the railroad graveyard, and became one of the richest fields of railroad endeavor. No man is now ashamed to say: "I am a Vanderbilt man!" He was ashamed in 1901, because the next question might be: "How did you get it, politics or blood-relationship?"

It will be noted that there is little of Mr. Vanderbilt in this sketch of his kingdom. Yet his shadow lies across it. The heavier the shadow the less the glory of the railroad. He was, and is, "the Railroad Aristocrat." He controls the New York Central, and through it all the other Eastern railroads of the system—simply because Commodore Vanderbilt, his progenitor, was a daring, restless, rough-and-tumble financier, who never coveted anything that he did not try to get, and who generally got it. He captured the Chicago & Northwestern while its owners were not looking. The present Vanderbilt very nearly lost it in 1902, when the Moores came within a few hundred votes of taking it out of his pocket. No railroad is safe in these days of licensed piracy, unless it be locked up in a safe-deposit box with only one key.

Mr. Vanderbilt hates roughness. He was shocked when the Moores raided the Northwestern. He likes to see things run along smoothly, does not see why Newman wanted to fight the Pennsylvania, can't understand why, a few years back, some of his men wanted to clamber into Pittsburg. His gospel, until recently, appears to have been, "Everything's all right!" Complacency, smug self-satisfaction, the consciousness of power, hedged him round about. His influence seems to have chilled, deadened, repressed his men. Mr. Samuel R. Callaway fretted, protested, and at last rebelled against this policy. President Newman, probably as able an executive officer as there is in the East, is only now beginning to show what he can do with the New York Central.

The chief end and aim of his endeavor must be to hold his traffic against the Pennsylvania. The days when these two giants fought their battles with the rate schedules as a weapon are gone forever. To-day, they are locked in a long, hard battle for the commerce of New York. Over the same ground where then they fought with suicidal rates, they are fighting again with millions upon millions of dollars as their weapons. The Pennsylvania spends $90,000,000 to get into New York with a new terminal; the New York Central replies with an expenditure of $70,000,000. The Pennsylvania this last year has spent over $30,000,000 on cars; the Vanderbilts immediately spend $25,000,000. It is a duel of endurance.

THE TWIN LORDS OF THE PENNSYLVANIA

Who owns the Pennsylvania Railroad? Go ask that question at the Broad Street station, in Philadelphia. Ask it a dozen different times, of a dozen different persons. The answer will always be the same: "The stockholders own the Pennsylvania Railroad!" The reply is unfailing. Is it true?

No man, no group of men, controls this road by the ownership of one-half its capital stock. If the ten biggest stockholders were to get

together, they probably would not hold enough stock to actually control the road. Yet one man votes each year a majority of the stock. The people who own this stock are scattered from one end of the world to the other. They send to one man the right to vote for them, and to vote as he pleases. If he proposes anything, they give him the stock to approve the proposal. If he wants to elect a certain man director, they send him their proxies so that he can elect the man.

The man in whom this power centres is Mr. Alexander J. Cassatt. He has been forty-five years in the service of the Pennsylvania. He started by carrying a rod for the engineers when he was twenty-two, a poor man. In the span of his active life, he has made of himself a multi-millionaire and the president of the greatest railroad in the world.

The seven years of his presidency have been marked by the most aggressive, daring, and even reckless policy of improvement. Hundreds of millions of dollars have been poured into the Pennsylvania Railroad. Mr. Cassatt, the president, has brought to realization many of the wildest dreams of Mr. Cassatt, the engineer. One of them is the entrance into New York City by the building of two long tunnels from Jersey City. Another is the building of two new lines of railroad from Pittsburg to Trenton, to relieve the strain of the traffic on the old roadway. Perhaps, before the full tale is told, another will be the making of a great shipping port out at Montauk Point, Long Island. Men have ceased to wonder at the doings of the Pennsylvania.

One day last spring, I went to a director of the Pennsylvania to ask him concerning a rumor that the road intended to raise money.

"I hear," said I, "that the Pennsylvania is going to raise a lot of money for the extensions."

"Why, no, that's hardly true—it isn't much!" said he.

"About how much?"

"Probably fifty millions!" was the quiet answer. That man, through being a director of the Pennsylvania Railroad, had actually come into a state of mind that made $50,000,000 look "not much." In this instance, the road not only raised that amount in New York, but, a month or so later, went to Paris and borrowed another $50,000,000.

The man who wields this power, who can command $100,000,000 of other people's money within sixty days, may be said to rule the Pennsylvania. Yet he does not rule alone. Behind him looms the shadow of the biggest stockholder, a man of many occupations, yet of none, a busy man, a shrewd, far-seeing man —Mr. H. Clay Frick, once of Pittsburg, now of New York. Mr. Frick is the Ethiopian in the Pennsylvania woodpile. In fact, he may be said to make a profession of haunting woodpiles. He is a wonderful personality, this little, trim, gray man, who came from the little poverty-ridden hut of the Pittsburg steel-worker to be one of the mightiest of the mighty beneath the shadow of Trinity spire.

Mr. Frick is not a director of the Pennsylvania Railroad. He has no authority, so far as the by-laws go. He merely suggests things to Mr. Cassatt, his friend of many years. He has been getting some attention to his suggestions for some years back. Indeed, he is a gentleman who gets considerable attention wherever he happens to be, whether he sit in the executive committee of the Steel Corporation, the Union Pacific, the Sante Fé, or merely in his own private office, talking to Philadelphia over his private telephone. He is credited with being the heaviest single owner of railroad stocks in the United States.

These two, Messrs. Cassatt and Frick, have been and are responsible for the Pennsylvania policy. It was they who brought it about that the Pennsylvania bought practical control of the roads which dominated the soft-coal traffic. It was they who lost the fight to George J. Gould at Pittsburg. It was they who projected and carried through the tremendous extension of the road to New York. The policy of the road is theirs. They are the Pennsylvania Railroad. They are that strange, elusive people—"the Stockholders of the Pennsylvania Railroad."

Their policy has one very direct result upon the relationship between the Pennsylvania and the public. They have vastly improved the railroad as a highway of commerce. They have made possible the growth of the commerce of New York, Philadephia, and Pittsburg. They have done far more than any other railroad to make it possible to pour an ever-increasing flood of traffic through the gaps of the Alleghany Mountains. In so far, the Cassatt policy on the Pennsylvania has been a public policy, and has made the road a better, more efficient servant of the public.

Of course, many smaller matters can be

brought up on the other side. It has without a doubt paid rebates to the Standard Oil Company, even as late as January, 1906. It has also, without a doubt, smashed very flat the little dream-castles of many and many a small mine-owner in western Pennsylvania. In the financial world, it has probably "frozen out" unfortunate minority stockholders at least as often as any other railroad. These are but incidents—large, maybe, to the individual, but small in relation to the general public.

Years ago, Mr. Andrew Carnegie had a fight with this Pennsylvania Railroad, just in the ordinary course of business, which, by the way, nearly always led him into a fight with some one or other. In the course of this fight, Mr. Carnegie made a contract with the Goulds that if they would bring the Wabash into Pittsburg, the Carnegie Steel Works would give the Wabash 25 per cent. of its tonnage, in and out. From that day, the Gould forces hammered at the gates of Pittsburg. The Pennsylvania withstood them, but lost its fight.

THE SICK MAN OF THE RAILROAD POWERS

For Mr. George J. Gould is in Pittsburg, and has even now completed his connection with the mills of the steel companies. This young magnate, like William K. Vanderbilt, inherited his railroads from a Wall Street speculator. Unlike Mr. Vanderbilt, however, he had a weakness for aggression. He dreamed of a Gould railroad from the Golden Gate to the North River. When the mists of the great battles cleared in 1898, when he had gathered up his shattered railroads, counted them, set them in line, and reckoned them, he found himself in command of five big railroads, the Missouri Pacific, the Wabash, the Texas Pacific, the St. Louis Southwestern, and the International & Great Northern. Immediately, he set about enlarging his kingdom. He reached westward to Salt Lake City by the purchase of the Denver & Rio Grande, bought the Central Branch Railroad, and took the first step toward Pittsburg by a syndicate purchase of the Wheeling & Lake Erie. This gave him a total system of about 16,500 miles of road.

The fight for Pittsburg and an Atlantic tidewater line was a terrific battle. It cost the Gould railroads close upon $40,000,000 cash to gain Pittsburg and build their plant in that city. Before they had accomplished it, New York had been given up. Mr. Gould bought the Western Maryland, a small road running into Baltimore, and determined to make his eastern terminal on Chesapeake Bay. Four large syndicates, including nearly eighty wealthy men throughout the country, were formed to help finance these Gould extensions.

Here one may put a finger upon the real cause of the Gould failure; for Mr. George J. Gould, with all his inherited millions, with all the prestige of his mighty kingdom, with all his rich advantages, is to-day the weakest of the magnates who rule the railroad world.

To every man who attempts great things there comes a moment of fearful crisis, of nerve-breaking strain, of terrible, pregnant decision. To Mr. Gould it came in the midst of the "rich men's panic," in what looked like a long period of collapse. He failed at that moment to rise to the occasion. It was a fearful occasion, and there may not be in the United States a man who could have met it, under those circumstances. Be that as it may, the bald fact remains that Mr. Gould lost at one stroke the confidence of the men who made his syndicates, and presently thereafter lost also the services and the allegiance of at least two of his strongest railroad men—Joseph Ramsey, Jr., and Russell Harding.

Mr. Gould, be it said, had accomplished his end. He had entered Pittsburg. He had secured a foothold on the Atlantic seaboard. It but remained to hold his syndicates about him, to make them a solid conquering phalanx, to bring their hundreds of millions into such close sympathy with his ambitions that he would be, as it were, the sovereign lord of their united exchecquer. By just such process has James J. Hill conquered the great Northwest. Had Mr. Gould done likewise, he would have been to-day one of the strongest of the magnates, instead of being the Sick Man of the Railroad Powers.

The manner and method of the man are clearly enough indicated in this brief sketch. Mr. Gould is not all weakness by any means. Behind him there is much ambition, much energy, much courage. He goes ahead at times almost impetuously, plunging headlong into projects of all sorts and sizes. If the energy and the determination were continuous, he would accomplish much, but he halts by the wayside every now and again. The Pittsburg plan was a glorious conception, well planned, and fairly well executed, up to a certain point. At all costs, it should have been made glorious

throughout. Then it would have been a fulcrum, upon which Mr. Gould could have moved the financial and railroad world to its deepest foundation. The vacillation, the little halt, the streak of financial meanness came—and then came enmity, open hostility, the closed hand, and the hard-locked treasury. Mr. Gould had committed the unpardonable crime. He had smitten Wall Street in the only place it feels a hurt, the money-nerve. It will take many years to win forgetfulness.

Outside of Wall Street, there has been in the last year much improvement in the Gould position. The disaffection and discontent that one encountered on the Missouri Pacific and the Wabash at that time are disappearing. Mr. F. A. Delano, the new president of the Wabash, appears to have stepped directly into the confidence of his men. Mr. Clarke, who came to the Missouri Pacific under the worst of auspices to succeed Mr. Harding, seems to have risen to the occasion. In Pittsburg, the connection with the steel plants has at last been completed. It was retarded by a foolish fight between the Colorado Fuel & Iron Company, which Mr. Gould now practically controls, and the United States Steel Corporation. This is a fair example of Gould tactlessness.

THE MAN WHO HAS KEPT FAITH

Many years ago, a syndicate was made up from the four corners of the earth to build a railroad through a wilderness. The man who made the syndicate was Mr. James J. Hill. He made it because Wall Street laughed at his request for money to build such a foolish-looking railroad. It did not run from any big city to any other big city. That was enough for Wall Street. Mr. Hill called on some friends in London, Montreal, and a few other places, and came back with the cash. He built the road. They call it the Great Northern. Every man who went into it with Mr. Hill in the beginning now owns his stock in it as a gift, for he has gotten the cost of it back in the intervening years, with interest, in the shape of dividends and bonuses.

That is pretty nearly the whole story of James J. Hill and the deeds that he has done. He has kept faith in the smallest detail with every man who entrusted so much as one dollar into his hands. He has made his followers rich men, where they were not rich before they came to him; and millionaires, where they were but wealthy men. Therefore is it true, as has been said of him:

"He can command more money in a blind pool than any other man in the world."

That means merely this, that while other great financial leaders must explain for what purpose they want the great sums of money for which they ask, Mr. Hill needs but to say: "Let me have the money and I shall give it back, with profits," and there will pour into his pockets whatever sum he asks. That is one of the most startling statements ever written about any man who deals in Wall Street but it is literally true in every letter.

To-day, Mr. Hill is closing up the record of a busy life. His years of service are drawing to a splendid close. One meets him, nowadays, a different man from the J. J. Hill of two short years ago. Then, he was losing a long and bitter fight for the Northern Securities Company, the outlawed creature of his making. Now, he has successfully sold the great ore lands to the Steel Corporation, and is making the biggest gift in his history to his old friends and associates, the stockholders of the Great Northern Railroad. "They have been loyal to me," he says.

That word "loyal" seems to play a very large part in the affairs of the Hill railroads. Perhaps it is because Mr. Hill himself likes to turn it over and over. At any rate, the loyalty of the Hill men to the Hill railroads is something startling. I know a man who left the Great Northern ten years ago and has served under three other magnates since that time. He was only a division superintendent on the Great Northern. He has been vice-president of two railroads since that time. Yet he is still a "Hill man," and he will be till he dies. The like of him is to be found on every railroad in the United States and some of the roads in Canada.

The Hill policy has many peculiarities. One of them is the fact that he loses more good men from his railroads than any other magnate. When a chief engineer was coaxed away from him a couple of years ago, he was asked why he let him go.

"They got over my price," he said.

That is not a very difficult thing to do. A man comes up through the Hill ranks by the sweat of his brow. When he gets up, the chances are that he can get much more from any other Western road than Mr. Hill thinks he is worth. The Hill service is one of the

hardest on the continent. Mr. Hill is an autocrat. He insists upon knowing all about the running of his roads, their results, their successes, their failures. The successes are rewarded with a careful hand. The failures seldom happen twice in the same place.

In his dealings with the public, Mr. Hill is unique. He is closer to his people than is any other of the heads of systems. He likes to talk at a county fair, and he very often does it. Agricultural conventions are in his line. He would sooner talk with a group of farmers out in Minnesota than lunch with Mr. Morgan. He has persuaded himself and a large part of the population of the Northwest that he is the best friend the farmer ever had. His remarks carry conviction, because they are made to fit exactly the public to whom they are addressed. He understands the people of the North and the West, and they think they understand him; so both are satisfied.

With his neighbors, Mr. Hill is always at war, but I have never seen him willing to admit it. Ask him about the "row" between the Great Northern and the Union Pacific over the Seattle entrance, and he will hurl at you two words:

"What row?"

By the time you have persuaded him that there is a row of some sort, you don't believe it yourself.

Go out to the Columbia River and watch his engineers blasting the north shore into fragments to lay a line to kill the Oregon Short Line; go into Seattle and listen while his lawyers fight the Union Pacific right-of-way down Fourth Avenue; go over the line and pace off the distance between his new Canadian road and the Canadian Pacific, alongside it; go watch his companies gridiron the region through which the Soo Line seeks its sustenance; tramp, if you will, with his engineers up through the North Platte Valley, step by step with the Harriman forces. You will come back filled with misgivings. You may go to Mr. Hill and tell him about it.

"You are making lots of trouble," you will say.

"Trouble, fiddlesticks!" he will reply, "We ain't going to hurt each other. There's plenty of room for us all!"

Down to the south of him lies the kingdom of Mr. E. H. Harriman. In this day, the Harriman hand has reached even to New York, and the Harriman fist is closing at last upon the Illinois Central. The Union Pacific Railroad is about to take the largest single interest in the Baltimore & Ohio Railroad, and the Harriman votes will swing the next annual election of the Illinois Central. This is the most stupendous ambition in the history of the American railroads.

HARRIMAN, THE MAN WHO WOULD BE KING

All the world yet remembers the Northern Pacific panic. No one forgets the long litigation that followed the dissolution of the Northern Securities Company. In the history of American finance, Mr. Harriman has many times openly written himself hostile to James J. Hill. To this day, the Harriman forces delight to sell the stocks of the Hill railroads. Mr. Harriman cannot dissemble. He has almost as much tact as a railroad train, but not quite. Nothing will stop him, once he has embarked upon a course of action. When the panic of 1901 was at its height, his own men came to him—his closest business associates and advisers—and begged him to relent, to give it up, to lend his stock and break the corner.

"No!" was all that he would say.

The financial world seemed tumbling in ruin about his head. The whole great structure trembled to its depths—men failed, banks tottered, magnates great and small raged, cursed, or pleaded, according to their need and wont. The little magnate in the big office on Pine Street let the tape slip swiftly through his fingers, watched the writhings of men's souls, cold, quiet, calculating—a terrible machine. He held the financial world in his hand that day. Men say it was a pure delight to him to watch it struggle as it lay.

And this is Harriman, the greatest of them all in the measure of the deeds that he has done! This is the man whose ambition knows no limitation, whose kingdom must stretch from sea to sea and from the Lakes to the Gulf of Mexico! He cares little or nothing for branch lines, for small local railroads. They do not fit into his scheme of conquest. He would be master of the main highways—let who will rule the provinces. He is the Man who would be King.

Perhaps that terrible ambition is to be realized within the coming year. No man that has studied the history of the Harriman rule over the Union Pacific can deny that it is an ambition dangerous to the transportation future

of the United States. It does not mean, however, the sudden wrecking of any of the railroads. Mr. Harriman has never wrecked a main line of railroad. He has built them up, fostered them, developed them. When one considers branches, however, it is a different story. The report of the engineers who examined the Kansas City Southern at the close of the Harriman régime tells the tale pretty clearly. It was practically a branch line. Therefore he let it go, caring nothing for it at all. Mr. Harriman has built up railroads, but not communities. With all its wealth, the Union Pacific has been left far behind by every other transcontinental railroad in the matter of building branches to open the country.

The Harriman mind travels in a straight line. He set out to make of the Union Pacific the main highway of transcontinental traffic. He did it. He did not care that there were a thousand villages within twenty-five miles of the Union Pacific starving for railroad facilities. He did not believe in the dissipation of capital resources for the building up of small communities into big ones. He let them starve. Perhaps he was right, perhaps not. It may be that the proper destiny of the Union Pacific was to build up its main line. At any rate, it made of Mr. Harriman the man he is, and made of the Union Pacific a Colossus, bestriding the continent.

THE SPHINX OF THE ROCK ISLAND

Scattered throughout the Trinity Building, the huge mass that stands sentinel at the corner of Broadway and Rector Street, is a clique of financiers and railroad men that Mr. Harriman honors with his especial enmity. For five years past, this coterie has been the most misunderstood and mis-translated factor in the financial world. The Rock Island Crowd remains, to this day, the deep, dark mystery of Wall Street.

These men control directly some 15,000 miles of good, granger railway. Most of it they took by storm. That is their favorite way. Their policy, at the moment, is pacific. It was also pacific two years ago, but they were at that time engaged in a daring raid on the Chicago & Alton, which they cut out from under the Harriman guns. It is an ill business guessing what these people are planning to do.

A few weeks ago, a reporter for one of the New York morning papers went to the Rock Island office seeking information. He asked to see "whoever runs this road."

"Well," said the clerk, "Mr. D. G. Reid is upstairs, and he is chairman of the board of the Rock Island Company. Mr. Mather is its president. Mr. B. F. Yoakum is the chairman of the board of the Rock Island Railway, and Mr. B. L. Winchell is its president. Mr. Davidson is the president of the St. Louis & San Francisco, if that's the road you want to know about!"

"Well, who's the Boss?" asked the reporter, laughing.

"Oh, I guess you mean Judge Moore," was the answer; "he is down in Massachusetts.—hasn't been here for four months."

That is the situation. There are three presidents and two chairmen in the Rock Island system, but "the Boss" is not an official at all. He is ex-judge William H. Moore—big, quiet, retiring, but omnipresent capitalist. He is not a railroad man, so to Mr. B. F. Yoakum, Mr. B. L. Winchell, and Mr. A. J. Davidson he gives the running of the railroads. He is a financier only in the biggest sense, so Mr. Reid and Mr. Mather look after that end of the system.

His work is the work of the general-in-chief. He makes the policy, approves the operations, vetoes or puts into effect the great financial plans. When the system needs millions of money he moves into the firing line. When it comes to purchasing thousands of new cars or dozens of new locomotives, he wants to know just why. In the council chamber, he is now supreme. In conflict with other powers, his is the hand that fires the train, or carries out the flag of truce. He is the arbiter of peace and war on the whole Rock Island system.

His standing is unique. Mr. Hill will know the exact rate in force on a shipment of grain from Omaha to Chicago, but he won't know the price of foreign exchange. Mr. Harriman will know both, probably for a month past. Mr. Vanderbilt won't know either, and won't care if he never does. Mr. Morgan won't tell any one what he knows, but leaves the impression that he knows much more than enough for all occasions. Judge Moore will refer to Mr. Yoakum for rates, but he knows the foreign exchange quotation for to-day and yesterday, and will make a good guess at what it will be to-morrow.

Primarily, the head of the Rock Island policy believes in having lots of money on hand

to run things. There was a time when Wall Street worried for fear of a Rock Island collapse. At that time, the system had nearly $20,000,000 tucked away for a rainy day. The rainy day came, but Wall Street never knew it. That is the principal business of Judge Moore, and it is a real live job for a real live man.

The relations between the Rock Island and its public are better than they were two years ago. At that time, the Middle West was hostile to the Moores. The old Rock Island was starving its shippers. The West wanted cars and the East wanted money, and you could not get the cars out West without spending the money in the East, so the West waited. It was a bad policy. It ended on October 4, 1904, in reality, but it was a year later before the last relic of the old, niggardly policy disappeared. Now, millions are being spent for the railroad, but nothing for dividends. The good-will of the people follows the money of the railroad.

. . . . . .

These are the Overlords of Traffic. They dominate the policies of over 160,000 miles of railroad, out of a total well below 225,000. Their ramifications extend perhaps much further. The policy of the small independent line in the West is largely dictated by its big connections. The Kansas City Southern, for instance, will hardly dare to inaugurate a new policy without consulting the Rock Island and the Atchison, at least. To all intents and purposes, the movement of traffic throughout the United States is dependent upon these seven men.

Whether or not this condition be dangerous, from an economic standpoint, is not a question within the province of this article. To answer the question, many considerations of wide import must be given weight. Rates must be discussed, to see whether or not consolidation has raised or lowered them. The influence of these mighty oligarchs upon the politics of the states must be measured with the extremest care. The growth or the stunting of the commerce of the country must be traced to the influence of consolidations.

It is enough to say that this great Senate of the railroad world is composed for the most part of men who have made themselves, who know the joy of conflict, the sense of commercial and monetary growth and expansion, the economics of industry. There is not one of them who is in any sense, as was Jay Gould in another generation, a wrecker of railroads or of communities. Financial exploitation is, among these men, secondary to the development of the area which they rule. No man can say of any one of them at the present moment that he has lost sight of his duty and the duty of his railroads to the people whom they serve.

EARNINGS

TOTAL EARNINGS, 1905, $ 2.082.000.000							
MORGAN	HARRIMAN	VANDERBILT	PENNSYLVANIA	HILL	GOULD	R.I.	
20.36 %	17.46 %	16.15 %	13.32 %	7.84%	5.84%	4.63%	
TOTAL UNDER CONTROL $ 1.776.659.000, 85 %							IND. 14.93%

MILEAGE

TOTAL MAIN LINE, 1905, 216,000 MILES.							
MORGAN	HARRIMAN	VANDERBILT	HILL	GOULD	MOORE	PENN.	
21.3%	13.4%	10.8%	9.3%	7.8%	6.7%	5.4%	
TOTAL UNDER CONTROL, 161,306 MILES, 74.7%							INDEPENDENT 25.3%

THE EMPIRES OF THE RAILROAD WORLD

Diagrams showing the mileage and earnings of the seven overlords, and of the independent lines

NEW MOTORS ON RAILROADS

ELECTRIC AND GASOLINE CARS REPLACING THE STEAM LOCOMOTIVE

BY

BERNARD MEIKLEJOHN

IT LOOKS like a nip and tuck race between the gasoline motor car and the electric locomotive to decide which will do most to give the steam locomotive the harder push toward the scrap heap. Day in and day out on branch lines of the Union Pacific Railroad near Omaha, and at other places, sleek steel cars, like sharp-nosed torpedo boats on wheels, slip along at from forty to sixty miles an hour, with passengers gazing out through air-tight windows into a smokeless atmosphere. They are gasoline motor cars, one type of many that have been adopted, or are being tested, on many railroads here and abroad.

One morning in the middle of November, 1906, passengers riding into New York on the New York, New Haven, and Hartford Railroad, after clattering for thirty-five miles between rows of iron trusswork pillars that will soon bear trolley wires, saw in the Grand Central yards the new electric third-rail locomotives of the New York Central shunting out through trains for their trip up the bank of the Hudson. These motor cars and electric locomotives already in practical use hint at a revolution in transportation which has gone on in the last three years that is almost as notable as the substitution of the steam locomotive for the stage-coach.

It will be some time yet before the steam locomotive will cease to be the best and cheapest mechanical horse for the main trunk railroads; and the locomotive builders go on improving their steam freight behemoths and passenger flyers as if they were in business for all time. But within the last year alone, the changes to electric power begun on railroads with heavy passenger traffic, especially near great cities, have been so enormous, and the experiments with motor-cars have been pursued so swiftly and successfully—gasoline cars have already run from Philadelphia to Kansas City and from Omaha to Portland, Oregon, and back—that the transformation is already advanced enough to foreshadow the decline of the steam locomotive.

Meanwhile the urban and interurban trolley lines are approaching from one side, as fast as the railroads are approaching from the other, the new type of train that will soon be carrying us and our mail, express, baggage and even much of our freight, swiftly, cleanly, and much more frequently than now, practically anywhere we wish to go. From 1890 to 1903 the street and interurban railways grew from 8,000 miles to nearly 25,000 miles, and the mileage has extended remarkably since 1903. This is nearly all electric line. The practical result of the novelties now being introduced on the railroads is that all this mileage, reaching all kinds of places inaccessible to the steam lines, is on the point of being so thoroughly welded into our huge railroad network that it will soon be indistinguishable—for it will be equipped with similar cars and motive power and offer similar facilities. One decides even now by tossing a coin whether to go from Dallas, Tex., to Fort Worth, or from Indianapolis, Ind., to Fort Wayne on the trolley or the railroad—it makes so little difference. It will soon make less.

Electric trains, where the traffic is, or can be made, dense and steady; gasoline-driven trains where the traffic is light or uncertain; cars that will run either in trains or alone by their own locomotive power, so that a train may start for even a small number of people and so that empty cars need not be hauled when not required—these are the novel machines that are opening a new era in transportation. They are just beginning to push the steam locomotive out of several important departments of work. Their results will soon show whether they can invade the field of long distance passenger transportation and long or short distance freight transportation, the two fields which the steam locomotive continues to dominate.

Why are the railroads being electrified? In Switzerland, in Italy, in Sweden, because coal is dear and waterfalls are cheap. In the United States and in England because trolley competition has become so menacing to the railroads and because the public, taught by the trolley lines that it is possible to travel without being forced to breathe smoke and collect cinders, have demanded relief from present railroad conditions, and the railroads have been disposed to heed. Millions of travelers entering and leaving New York City, have been obliged to suffer a very purgatory passing through a tunnel that led one man to say that if he should go to Hades he wished to go on one of the two roads that use the tunnel, because then he would be glad when he got there. When one morning, several years ago, a terrible accident took place in the mist and gas and steam and smoke of this tunnel, it became plain that relief must come soon. Mr. W. J. Wilgus, the fifth vice-president of the New York Central Railroad, insisted so vigorously that electric trains were feasible that he was given authority to install them.

The New York, New Haven, and Hartford Railroad, which also uses the tunnel, could not be behindhand, and it, too, soon laid plans to use electric trains. Meanwhile the Pennsylvania Railroad, adopting its plan to tunnel the Hudson River and establish its terminal in New York City, could see no way of carrying passengers through a long underground bore except by electrical power. The necessity of undergoing a huge expense for electrical equipment naturally led the operating officers of these three great railroads to search for ways to make the installation pay. The only practicable way was to extend the electrified part of the line to the limit of surburban travel, and to make use of the advantages of flexible electric trains to give better and more frequent service, thus attracting more traffic. For it is a railroad axiom that the size of the "traveling public" does not depend any more on density of population than it does on convenient service which lures whatever population there is in a given section into the "traveling habit."

So the "Central" set to work electrifying the line from the Grand Central Station to the Harlem River with the intention of running the electric trains to Croton, 30 miles out on the main line, and to White Plains on the Harlem branch; and the "New Haven" began setting up its posts for trolley wires with a view to electric train service ultimately for 61 miles to New Haven. The Erie, the Long Island, and other railroads entering New York naturally had to follow their competitors within the suburban zone. Study of the problem led to careful investigations of the comparative cost of electric and steam traction by railroad men, and to the building and testing of electric locomotives and cars. With a number of electrified railroads in operation abroad and with the railroads entering New York committed to electricity—and with the advantages of electricity patent to the public—railroad officers in various parts of the country have now turned their attention to the possibilities of electrification. Small electric lines like the Lackawanna and Wyoming Valley, running from Scranton, Pa., to Wilkesbarre, and the Atlantic City and Shore Line are watched with interest, for they are equipped as the electrified steam roads will be for their surburban traffic, but these lines are highly developed interurban lines, and not remodeled steam railroads. They simply show that the interurban road, at its best, with freight and baggage facilities—not to speak of sleeping cars, and parlor cars such as are running in the Middle West—have adopted the very form of train which the most advanced railroads are just arriving at. The example of the New York railroads is not likely to be generally followed by other steam lines on which conditions are ripe for the change until practice proves what kind of electrical equipment is best.

For a pretty controversy rages. The New York Central is spending $70,000,000 for a third-rail equipment using direct electrical current at low voltage. The New Haven is installing an overhead single-phase trolley system carrying an alternating current of very high voltage. The Pennsylvania is following the Central's plan and the Erie the New Haven's. From a position a short distance from the tracks, one could not tell that any change had been made in the Central's right of way except for the shiny brown tops of jumper connections which stand two feet high at intervals along the track, in contact with the live third rail. The New Haven line, on the other hand, with its parallel rows of tall iron posts, looks like the interior of the New York subway with the roof off. The locomotives are quite different, as the illustrations of this article show.

But perhaps the most significant difference is in the motors to be used.

An invention put out by the Westinghouse Company, about two years ago, and since then used successfully on an interurban railway between Indianapolis and Cincinnati, was a motor that solved one of the knottiest problems that have confronted electrical engineers. It was long ago found impracticable to send direct current over long distances on transmission lines, owing to losses from the wires. On the other hand, the alternating current, which can be transmitted long distances at a high voltage with little loss, has required the maintenance of transforming stations where it can be changed into direct current at low voltage to be used in motors—which means expense. If a motor could be built that could use the high pressure alternating current, this expense would be eliminated, for the alternating current could be sent directly from a single power house over a wire to any car on the line that used it. The Westinghouse Company produced such a motor and perfected it. On this alternating-current single-phase motor, which requires only a single trolley wire to feed it and which needs no other transforming device than can be carried in the locomotive itself, and the equipment that goes with it the New Haven road has staked the millions it is investing in its electrical installation. The Central is sticking to the General Electric Company's more conservative direct-current third-rail system with power house stations at intervals. The competition between these two huge radically different equipments will probably settle the form that the electrification of railroads will ultimately take.

ELECTRIC LOCOMOTIVE AND THE THIRD RAIL

Though the New Grand Central terminal has not yet been completed (fourteen blocks have been torn out of the heart of New York City to provide a commodious new entrance for the traffic the electric service is expected to produce), the New York Central has now 35 electric locomotives in commission. Those now in use are employed simply to take through trains through the tunnel. Suburban service will be furnished by electric motor cars much like those on the Boston Elevated Railway or the steel cars in the New York Subway. Many people have thought that suburban trains on the Central and on other roads would be drawn by the electric locomotives which haul the through trains. It is doubtful, however, whether this mode of electrification would improve prevailing conditions, except in cleanliness. The real significance of the adoption of electricity is the introduction in suburban traffic of the cars like the familiar ones of Elevated and Subway and not different from the best cars on the most advanced interurban lines.

Their advantage is that every car, or almost every car, is a locomotive in itself. When many cars are made up into a train, the motors on all the live cars help in propulsion, though the control is held by the first, where the engineer has his post. The beauty of this equipment lies in its flexibility. The number of cars in a train can be made to vary with the traffic. Cars can be dropped off or added at any station. The practice of railroads has been to run trains at long enough intervals to give some assurance that they can be filled. With the new equipment there can be a much greater frequency, for at any hour of the day when few people normally wish to travel, a long enough train can be provided, or even a single car, for the few who do. At rush hours heavy trains can be sent out at frequent intervals. The swift acceleration of electric cars makes it possible to run many trains at high speed and yet make many stops. The Central now has one hundred and eighty-six of these independent motor cars, which will run to the end of the track now electrified and there be picked up by steam locomotives for their destination until the lines are equipped with the third rail up to the limit now planned. This limit will be twenty-four miles out from the Grand Central Station on the Harlem branch and twenty-eight miles out from Mott Haven Junction on the Hudson division.

Two hundred and eighty-five miles of track are being equipped with the third rail. An entirely new system of electrical signals is being installed. An army of men has been at work for more than three years remodelling the right of way and preparing the new Grand Central Station to receive the trains of both the Central and the New Haven. A huge excavation was dug covering an area of thirty-nine acres on which twenty-five miles of track will be laid on two levels below the street, one level for express trains and one for locals. A new station has been built at Mott Haven Junction which will connect with two subway systems. Altogether there will be six new passenger stations in the electrical zone already

equipped, and there will be twenty-three new ones within the range of the suburban electric motor cars when the work is completed. The third rail is protected, and Mr. Wilgus believes that it will not be any more dangerous than any other form of electric installation. The whole huge remodeling of railroad and terminal will cost $70,000,000.

The electric locomotives for a time will draw trains only between the Harlem river and the Grand Central Station, but later will pick them up and drop them about 30 miles out. The locomotives themselves have been tested so many times that it is now clear what they can do. On a six-mile stretch of experimental track at Schenectady they were racing with steam trains more than two years ago and beating them, for they are capable of a speed running up to eighty miles an hour. They have a capacity of twenty-two hundred horse power. Some interesting tests were made recently to discover whether they could get up speed as rapidly as a steam locomotive. In the run in which conditions were similar to those which will prevail in actual work the electric locomotive walked away from the puffing steam locomotive, and in five hundred yards had secured a lead of a six-car train length. To show the advantage of the electric locomotive these facts were noted: The locomotive was thirty feet shorter than the steam locomotive, weighed seventy tons less, drew a load of fifty-one tons more, and reached a speed of fifty miles an hour a minute sooner, speeding along smoothly, and leaving, of course, no smoke. The steadiness of the electrical locomotives has surprised everyone who has ridden on one, for they do not "nose" the track as steam locomotives do, and they round curves with greater ease. The first experimental train ran into the Grand Central Station last September.

THE OVERHEAD SYSTEM

The New Haven road will operate both the motor cars for suburban traffic and electrical locomotives for the through trains between Stamford, Conn., and Woodlawn, whence the New Haven trains run into the Grand Central Station over the New York Central's tracks. A single power house on the bank of the Mianus River at Cos Cob, Conn., will furnish the elec- at eleven thousand volts which provides the power for the whole twenty-two miles, without the intervention of transforming stations.

The trolley wire will be supported on steel bridges every three hundred feet, though every two miles there are more massive structures called anchor bridges. These bridges, in addition to carrying the trolley wire, will support a new system of signals. Both electrical locomotives and motor cars will be equipped with alternating current motors, which, however, will work on direct current too. When the trolley arms run off the wires on reaching the New York Central tracks, contact-shoes will at once engage the third rail. This motor equipment is the innovation the workings of which will be watched with huge interest. At the time of writing, the railroad expects to have the trains running by the time this article is published. The charges are estimated to cost more than $25,000 a mile.

It is idle here to go into the controversy regarding the comparative merits of this equipment and the third-rail system. It costs more to build the trolley wire bridges than to lay the third rail, but on the other hand it costs more to build and run the transforming stations than to dispense with them. It is fatal to step on a live third rail if the insulation has worn off, but it also is bad to come in contact with a wire carrying eleven thousand volts of electricity if you happen to be a brakeman on top of a freight car. A terrible tragedy would ensue if a train should crash into a trolley wire support and bring the wire down, but it would probably be equally disastrous if a derailed train should plough up the third rail. The comparative excellence of these two systems will have to be left for results to prove. In any event, by these innovations of two great railroads, coupled with the adoption of similar devices on other lines entering the city, New York will soon have a suburban service reaching far into the country on every side that will scarcely differ from the Rapid Transit service it now possesses in Subway and Elevated systems, except that the volume of traffic will not call for so frequent trains. The city limits will be practically wiped out.

The adoption of similar electrical devices in other places depends on the number of people who can be induced to travel. Essentially an electrified railroad is one on which locomotives, which are individual moving power-houses, are replaced by a single power-house which feeds the power to the trains. The initial cost of the electrical equipment is so great, and the expense of maintenance so heavy, that they are justified only where the volume of traffic is great enough

to employ the maximum production of the power-house. Thickly populated districts are the only ones thus far that furnish a great enough and steady enough traffic to do this. This holds true of places where the electricity must be produced from coal. The success of the Valtellina line and others in Italy and Switzerland show that electrical operation can be made cheaper than steam operation in regions where power-houses can be run by water power. Thirty-four miles of the Erie Railroad, for example, is to be electrified on the Rochester division with power transmitted 70 miles from Niagara Falls. Conditions are favorable for the electrification of the whole New York, New Haven, and Hartford system in the near future, for it runs in a populous territory well provided with water power. On the other hand, the electrification of a road like the Great Northern is so far in the future that one can scarcely imagine it, though it has been announced that Mr. Hill will equip with electricity a new line to run between Portland, Ore., and Seattle, Wash. The railroad men say: "Modern steam locomotives can exert a horse-power a day for every two pounds of coal burned in the firebox. No other equipment has yet proved itself capable of operating so cheaply on any railroad that runs infrequent heavy trains—as most American trunk railroads do."

GASOLINE AND OTHER MOTOR CARS

Nor is the gasoline motor-car yet powerful enough to displace the steam locomotive. It is something of a marvel that machines like those now in service on the Union Pacific Railroad were built without a long series of halting experiments. They came into being, however, as imitations of motor-cars used abroad—a gasoline motor car was run on the Wurtemburg street railway as early as 1893—and much was learned from automobile practice. They are now making daily trips at Omaha, Neb., at Los Angeles, Cal., at Portland, Ore., between Houston and Galveston, Tex., and in other places, in one branch of railroad work only. If the electrical train is economical only on lines with heavy traffic, the gasoline motor-car thus far seems fitted only to lines where the traffic is light. The cars are used on the Union Pacific system to make one round trip a day over branch lines—between Kearney and Callaway, Neb., 65 miles, between Leavenworth and Lawrence, Kan., 68 miles, and on other such trips—to serve sparsely settled districts, or to act as feeders for main lines. This is the field of the self-propelled car. Requiring only a motorman, and an attendant, in the passenger compartment, a motor-car dispenses with the more costly crew of a regular steam train. It is ready to move at once without any waiting to get up fires, is indeed practically an automobile on rails. For comparatively short runs the motor-cars, even though they use gasoline at nine cents a gallon, compare favorably with steam trains in cost, though as soon as traffic grows so heavy as to require many well patronized trips a day the steam trains again are favored by railroad men. This has been found true in England where a number of lines have motor-cars—though the distances they cover are less than those traversed on the Union Pacific—and it is the conclusion arrived at from the experience of other American lines, the Delaware and Hudson and others, on which motor-cars are being tried. Mr. F. W. Hild, the chief engineer of the Southwestern Wisconsin Interurban Railway, has worked out the following comparison of costs under varying conditions:

COST PER MILE PER CAR

	Mileage	Steam	Electric	Gasoline
6 round trips, daily	300	$73.29	$51.36	$54.70
5 round trips, daily	250	62.53	47.55	47.40
4 round trips, daily	200	51.78	43.74	40.10
3 round trips, daily	150	41.03	39.93	32.80
2 round trips, daily	100	30.28	36.12	25.50
1 round trip, daily	50	19.53	32.31	18.20

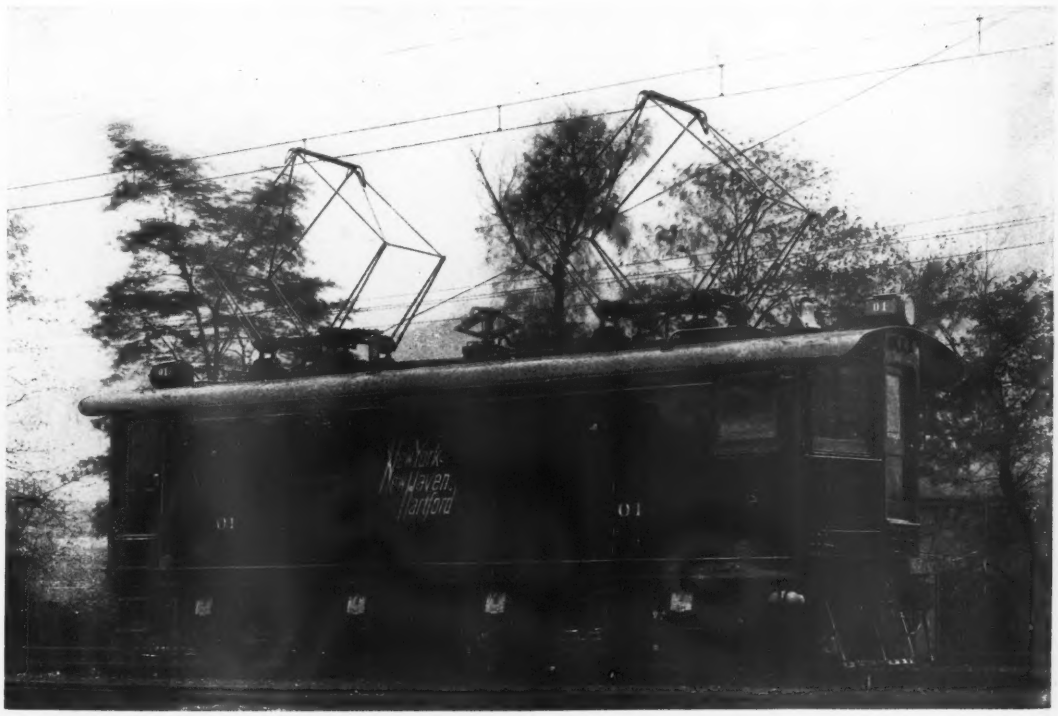
According to this the motor-cars are the cheapest only on short runs with infrequent trips.

Nor does the gasoline motor-car have things all its own way even in restricted service. Steam motor-cars and electric motor-cars in which a gasoline engine, instead of directly driving the wheels, generates electricity by which the car is propelled, are being tried to see if they are not cheaper and better. The Erie Railroad and the Canadian Pacific, for example, are experimenting with steam motor-cars, and the Delaware and Hudson is now running a gasoline-electric car regularly between Schenectady and Saratoga, N. Y.

The gasoline cars of the Union Pacific, however, have had the longest trial in the United States, and it is on their performances that railroad men are now figuring. A committee of the American Master Mechanics Association which has made an investigation of motor-cars comes to the conclusion that for conditions

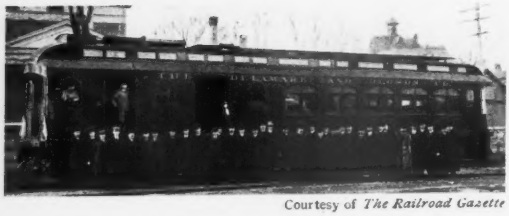
NEW YORK CENTRAL ELECTRIC LOCOMOTIVE

The first experimental train into the Grand Central Station



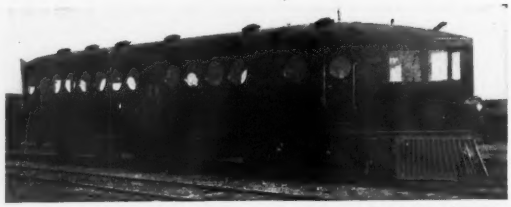
ONE OF THE "NEW HAVEN" LOCOMOTIVES

It is equipped to use either direct or alternating current



Courtesy of *The Railroad Gazette*

A COMBINATION PASSENGER AND BAGGAGE MOTOR CAR DRIVEN BY GASOLINE-ELECTRIC POWER



Courtesy of *The Railroad Gazette*

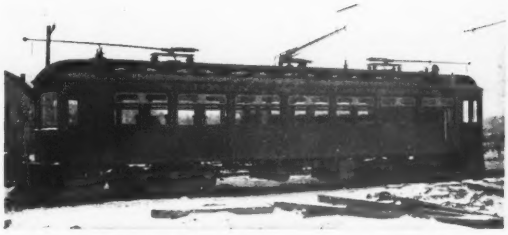
UNION PACIFIC MOTOR CAR No. 8—AIR-TIGHT, GASOLINE DRIVEN

such as those that ordinarily prevail west of the Missouri River, that is, where traffic is light and trains infrequent, these Union Pacific gasoline cars have proved their worth. A local steam train with a locomotive, two cars, expenses for labor, repairs, cleaning, and so on, costs 24 cents a mile to operate. Electric service with one motor-car and a trailer costs 18 cents a mile, provided the traffic be dense enough to keep the line busy seven days a week. It must be recalled, however, that electrical service requires an elaborate trolley or third-rail equipment. A gasoline motor-car with a trailer, offering baggage, mail, and express, as well as passenger service, costs 15 cents a mile. This is the cost whether the cars run six days or seven, depending wholly on the amount of service to which they are put. Who is to say that with a showing like this the self-propelled motor-car has not far wider possibilities than have yet been taken advantage of. These Union Pacific cars have traveled from Omaha, Neb., to Portland, Ore., and back again, from Omaha to New York and to Los Angeles, Cal. The Strang gasoline electric car "Ogerita" ran from Philadelphia to Kansas City, maintaining a speed over much of the route of 45 miles an hour, and it bucked snowdrifts with considerable success last winter on the Santa Fé lines in Kansas. It ran eighteen thousand miles without requiring repairs. The cars are easily capable of traveling more than a mile a minute. Will not the millionaires in the near future have each his private gasoline car to travel where he will?

A typical car of advanced design is No. 8 on the Union Pacific. It seats 75 people. The windows are made like the portholes of a vessel, with round panes that keep out water, dust, and even air. A ventilation system takes in

THE GRAND CENTRAL STATION YARD, NEW YORK, BEFORE THE REMODELING

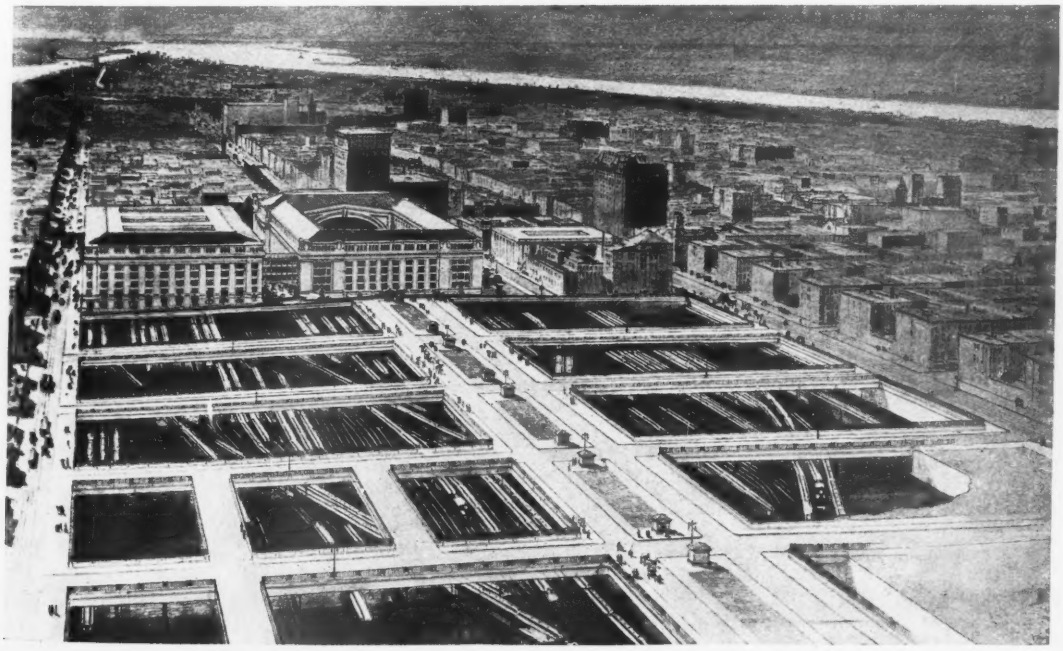
AN INTERURBAN TROLLEY CAR FOR FREIGHT



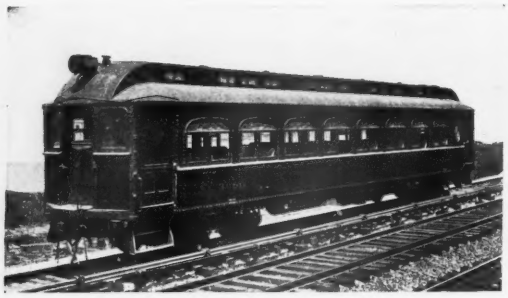
THE INTERURBAN CAR OF THE FUTURE

fresh air at the front of the car and lets out the vitiated air at the rear. The entrance steps are let into the sides of the car. The car when under way is as snug and neat as a racing motor-boat. It is two feet lower than an ordinary car, pointed in front and rounded at the back, offering thus a minimum wind resistance. It starts gently, makes little noise, and can run as fast as 70 miles an hour. The experience of the Union Pacific with all its cars has been that they do not require many repairs. With baggage and smoking compartments and comfortable seats for passengers, motor-cars have already come to be regarded as offering one of the luxuries of travel. Most of the cars now in use are more like ordinary coaches than the Union Pacific's Number 8, resembling the familiar combination of baggage and smoking car. Traveling in motor-cars is smoother and pleasanter than in regular electric cars, and cleaner than riding in steam trains.

The course that the three innovations outlined—the electric locomotive, the suburban electric car, and the railway motor-car—indicate as the direction of railroad progress, seems to be this: The motor-cars will increase traffic on branch lines until the volume is great enough to justify the installation of electric cars. The electric cars will be the typical form of transportation machines within wide zones about great cities. The branch-line cars will be practically interchangeable with interurban cars on trolley lines—this is, indeed, one of the improvements provided for in the electrification scheme of the New York, New Haven & Hartford Railroad, which now owns the main inter-

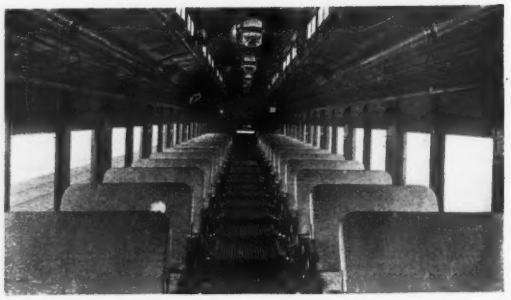


THE GRAND CENTRAL STATION AND YARDS, NEW YORK, AS THEY WILL BE



A RAILROAD ELECTRIC MOTOR CAR

All roads entering New York City will run cars like these and other railroads elsewhere must follow

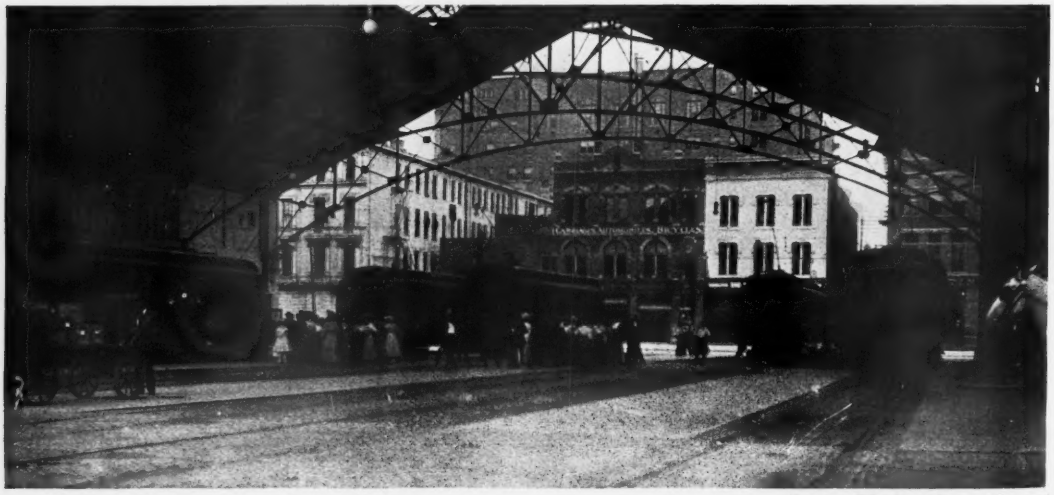


THE INTERIOR OF THE CAR

The absence of smoke and cinders will make the improvement still greater and the steel construction adds security

urban trolley lines of Connecticut and a number of important lines in Massachusetts. The public demand will require that the intervening links of track between the rural districts equipped with trolley lines and the zones in which frequent trains run about the cities be connected. With the electrical locomotive operating within these city zones for both freight trains and through passenger trains, and with the main lines already provided with electrical passenger equipment, who does not perceive that in all the thickly settled portions of the country, the steam locomotive will go to the scrap-heap? Cost is an important element in transportation changes, but it is not the only element. With increasing Government control of railroads, it is even a possibility that smoky steam locomotives will be legislated out of existence, if they are not put out by the railroads themselves, except on the huge semi-desert spaces of the Far West. Meanwhile neither steam railroads nor interurban or city trolley lines have been backward in making notable improvements. Superheaters on locomotives, insuring a great saving in coal consumption, the compulsory use of automatic couplers, electric and other automatic signal devices—all are making the railroads an increasingly efficient transportation machine.

With all these improvements introduced to make our railroad travel more convenient, cleaner, pleasanter, and safer, and with the interurban trolley lines extending their scope and approaching closer and closer to railroad operation—running long distance through cars at high speeds, employing in some places sleeping cars and in many places a frequent rural freight service for farmers—the transportation of the near future promises a revolutionary advance over present methods.



Courtesy of the *Street Railway Journal*

TRAIN SHED OF THE INTERURBAN UNION STATION AT INDIANAPOLIS, IND.

HARRIMAN

I

THE MAN IN THE MAKING

HIS EARLY LIFE AND START

BY

C. M. KEYS

1863

1906

SOME twenty years ago, Mr. J. P. Morgan planned a readjustment of the finances of the Erie Railroad. The great banker had undertaken the task of clearing up the difficulties left over from the time of Jay Gould, Daniel Drew, and Jim Fisk. He had made a plan which he thought should be acceptable. Nothing remained but to get the assent of the stockholders. Everything was going along nicely.

Suddenly the well-oiled machinery came to a stop, as though some one had dropped a stone between two cog-wheels. A comparatively unknown broker had called together some of his friends who happened to be deep in the Erie morass, and had persuaded them to stand with him in demanding better terms from Mr. Morgan. His insight into the situation was so clear, his exposition of it so plain, that he was able to hold his men together and make their position so strong that they forced concessions from the Morgan firm.

The name of the broker was Edward H. Harriman. When the Morgan people asked him whom he represented he replied, brusquely:

"Myself!"

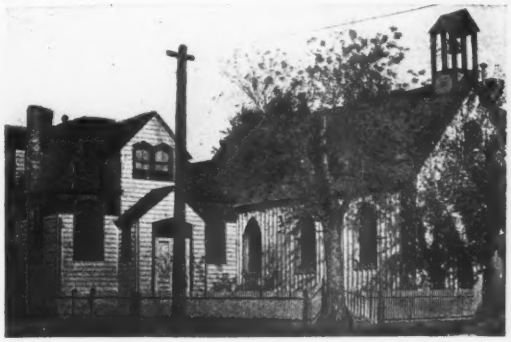
This episode, it will be noted, happened twenty years ago. It has happened many times since, in different forms. When this same Harriman appeared on the Illinois Central board of directors in 1883, he was asked the same question and he answered it in the same way. When he bought into the Union Pacific Railroad in 1897, he would not answer it at all, so Wall Street decided that he was a "Vanderbilt man." A little later came the supposition that he was, and is, a "Standard Oil man." There is no conclusive proof that he at the present time represents anyone but Edward H. Harriman.

WHO AND WHAT IS HARRIMAN?

Who, then, is this E. H. Harriman? Wall Street has been asking this question, savagely at times, for the past ten years. The United States has begun to ask it, curiously, in the past

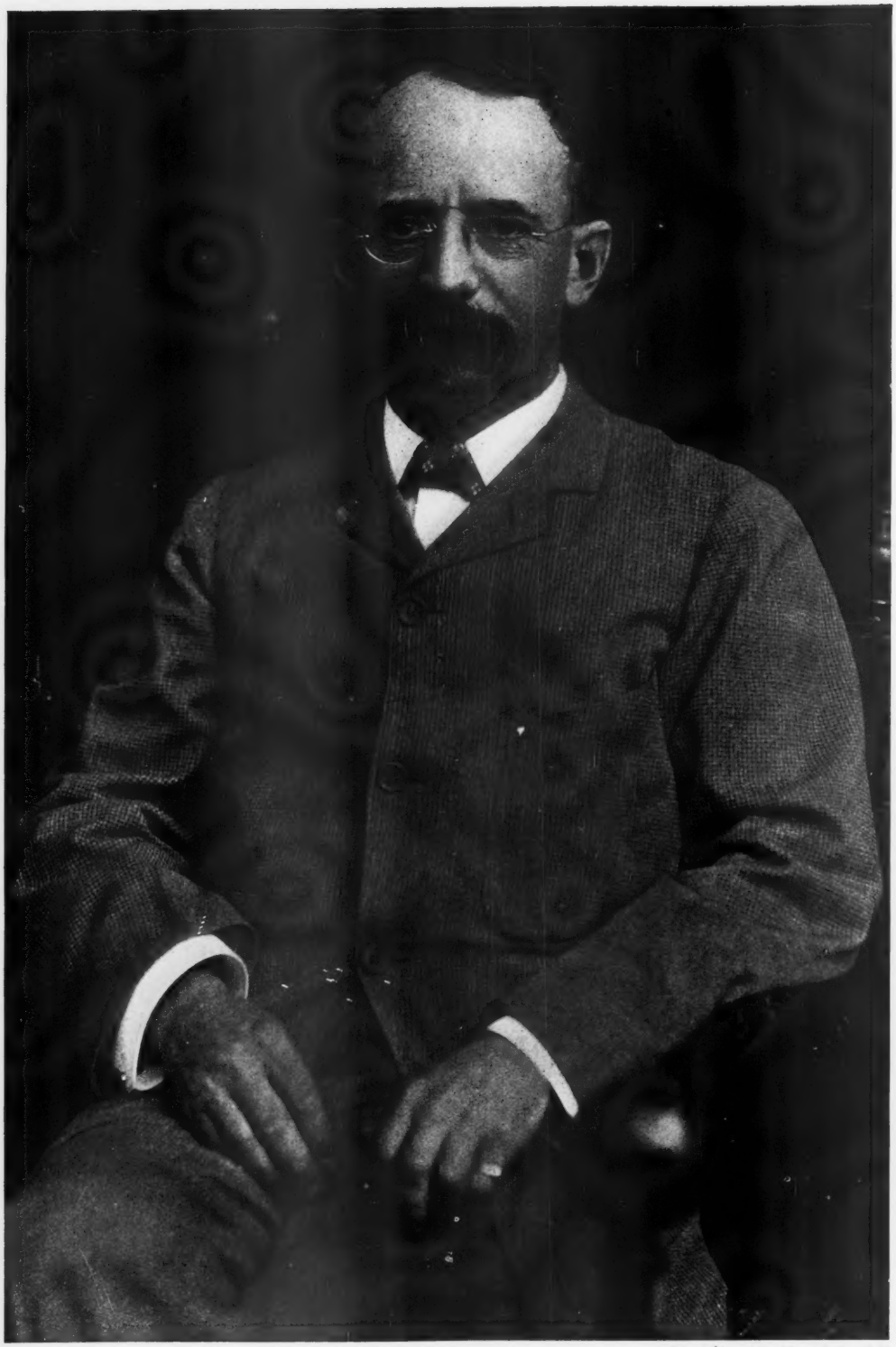
MR. HARRIMAN'S BIRTHPLACE

St. George's Rectory, Hempstead, L. I., where he was born February 25, 1848



ONE OF HIS FATHER'S CHURCHES

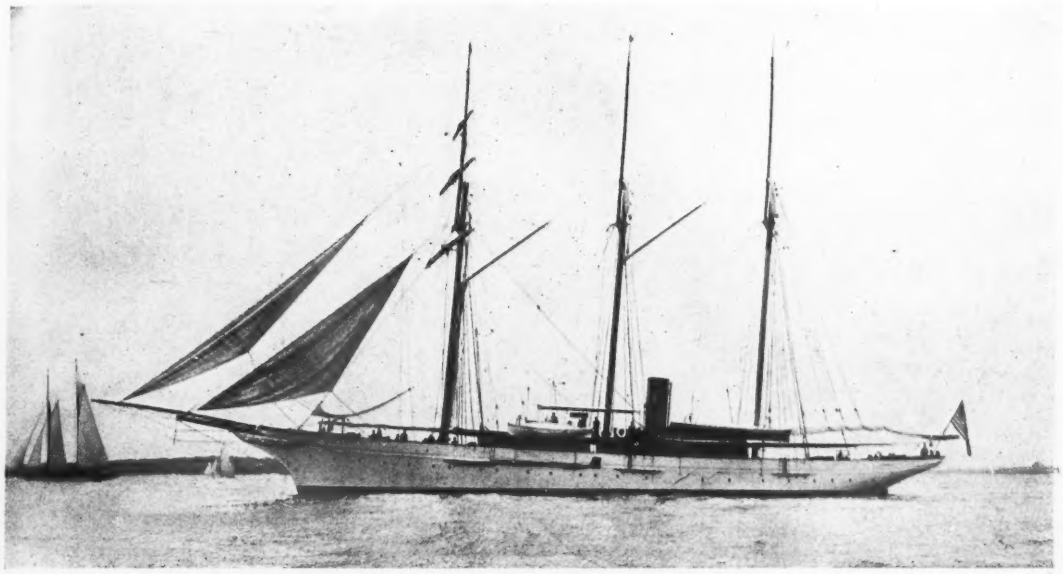
St. John's, West Hoboken, N. J., which he served on a salary of $200 per annum



Copyright, 1906, by Alman & Co., N. Y.

MR. E. H. HARRIMAN IN 1906

"The little man in the big office on Pine Street let the tape slip swiftly through his fingers, watched the writhing of men's souls, cold, quiet, calculating—a terrible machine"



Photograph by James Burton, N. Y.

MR. HARRIMAN'S STEAM YACHT "SULTANA"
One of the fleet of ocean-going pleasure boats

MISS HARRIMAN OUT FOR A DRIVE
Mr. E. H. Harriman is shown at the right of the picture

Photograph by Brown Bros.

THE BOY'S CLUB, NEW YORK

One of Mr. Harriman's quiet charities

Photograph by Brown Bros.

MR. HARRIMAN'S CITY HOME

No. 1 East Fifty-fifth Street, New York

two years. At this moment both are asking it, importunately, even fiercely. Mr. Harriman has ceased to be an individual. He has become a national figure, perhaps a national menace. As the head of over 25,000 miles of American railroad, he has on his pay-rolls more than twice as many men as there are in the standing army of the United States. In

Photograph by Brown Bros.

THE VILLA AT ARDEN

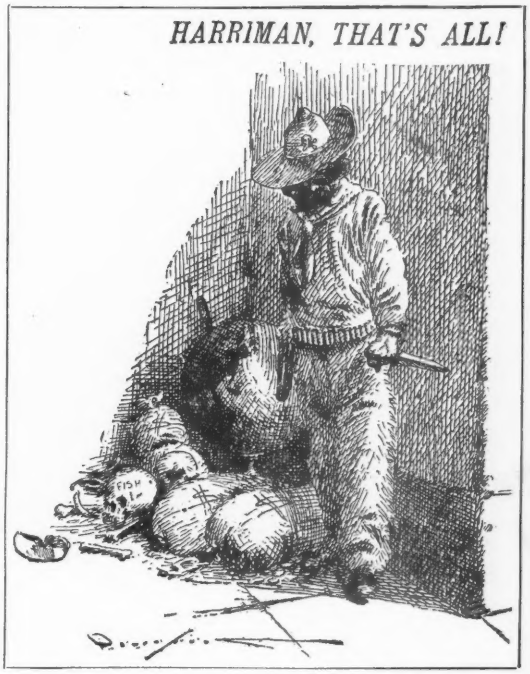
Mr. Harriman owns a vast estate in the Ramapo Mountains of New York. This is his summer home

the political world, he is credited with having been the power behind a Governor of the state of New York, B. B. Odell; and with being now absolutely in command of the Republican party in California. In finance, he has figured within the last year or so as one of the alleged jugglers of the funds of the Equitable Life Assurance Society, arbiter of funds amounting to over $150,000,000 owned by the Union Pacific and allied railroads and express companies, and able to command the financial power wielded by the largest private banking house in the United States, Kuhn, Loeb & Co.

may find an ancient church, founded in 1702. It stands in the midst of a graveyard. To-day, it is a highly fashionable church. If one enter, the guide will point out here the pew of the August Belmonts; there the pew of the Fulton Cuttings; here, again, the pew of Theodore Havemeyer, Jr.—names great in the gilded list of the plutocracy. Perhaps one will stop to admire the simple beauty of the chancel.

"That," says the guide, "is a Harriman memorial. Mr. Edward H. Harriman and his brother paid for it, because they were born here."

"Scar," in the N. Y. Globe



Davenport, in the N. Y. Mail

MR. E. H. HARRIMAN, AS TWO CARTOONISTS SEE HIM

Mr. Harriman, for some unknown reason, has always carefully concealed the early history of himself and his family. The writer knows many of his friends and most of his enemies in Wall Street. Not one of them has been willing to tell the story. Most of them could not. Those who could would not, because of Mr. Harriman's well-known objection. The consequence is that, to this date, the people of the United States know nothing of the man who seems to be the one individual most prominently before the public eye.

Down at Hempstead, Long Island, the visitor

The record of the church shows that Edward Henry Harriman was born on February 25, 1848, in the rectory of this parish. His father was Rev. Orlando Harriman, Jr., then in charge of the parish, which is Episcopalian.

THE POVERTY OF HIS YOUTH

Following this clue, the story of the childhood and youth of Edward Henry Harriman unfolds itself. His father, Rev. Orlando Harriman, Jr., first appears in the records of the Episcopal Church in 1841, as a deacon. In 1842, he was junior principal of the Academy

at Sing Sing, N. Y.; in 1843, assistant rector of Christ Church, Tarrytown, N. Y.; and on February 14, 1844, was appointed rector of St. George's Church, Hempstead, L. I. He held that position until 1849. The records of the convention of that year disclose a controversy between him and his vestry over arrears of salary. In the next year he was assistant rector of St. Paul's, Castleton, S. I. In succeeding clergy lists up to 1855, he appears as without a charge.

In this year, when Edward Henry Harriman was but six years old, the family moved to Jersey City. There were four boys, known among their intimates as Nelson, Orlando, Henry, and William; and two girls, Lily and Annie. There followed a period of extreme hardship, even poverty. Up to 1859, the Rev. Orlando Harriman had no steady charge. He helped wherever he had a chance. In this year he began anew as rector of St. John's, West Hoboken. The following paragraph is taken from the records of that church:

"On the ninth of May, 1859, Rev. Orlando Harriman was elected rector at a salary of $200 per annum, and accepted the call the same evening on which it was extended. It is said that Mr. Harriman received another salary for services elsewhere. He remained in charge of the parish for about seven and a half years, till November, 1866. At that time his salary was $374 in arrears, which was compromised at $250, payable in six months, with interest."

From an entry in Mr. Harriman's own writing, it appears that the other church was Christ Church, Claremont, and that his work there was practically without stipend except when the regular rector was absent. During this same period he assisted the rector of Grace Church, Van Vorst, Jersey City, without regular salary.

Over this long period from 1850 to 1866 hangs a heavy cloud. It was a period of poverty, of humility, of terrible discipline. The family lived in a small house on the meadows. There was never enough money to go around. Making ends meet was a task of the supremest difficulty. It was a dark time indeed.

HIS MOTHER'S PRIDE OF LINEAGE

Yet through the darkness shines one splendid ray of light. It is the personality of a noble woman, the mother of Edward H. Harriman. Her splendor lives not in cold records but in the hearts of those who knew her. She came of an old aristocratic family of New Brunswick, N. J., and lived up to the best of its traditions. In the midst of hardships, she taught her husband patience and her sons true manliness. Every effort of her hands and mind was given to the future of her sons and daughters. She is described as a cultured, refined, and wholly amiable lady of that old school now unhappily departed. How much of his steadfastness, courage, and superb command Edward H. Harriman owes to her, the world can but blindly guess.

Through the death of a relative of Mrs. Harriman, the family inherited some money late in the 'sixties. The amount is variously guessed by those who knew them. It was enough, at any rate, to permit of the retirement of the elder Harriman from active work, and the purchase of a comfortable homestead at the corner of Erie and Eighth Streets, Jersey City. There the family lived in comfort for many years. Perhaps fortunately, the money came too late to give to the older boys much education. Edward H. Harriman, commonly called Henry by those who knew him then, was educated in the district school, and finished with a two years' course in a boys' school under church auspices, where the sons of the clergy paid practically nothing for an education. His schooling gave no promise of the future to which he was destined.

To understand the character of Edward H. Harriman, a side-light from the family relationships at this period will be found most useful. Both Orlando Harriman, Sr., and Mrs. Harriman were born and bred aristocrats. Both had that terrible bane of the poor—pride of family. They lived in a haughty exclusiveness, teaching their children to follow social lines closely. As they grew older, and as they grew more comfortable, this feeling intensified; their circle narrowed, they knew few people, and cared to know no more. Within the circle the warmest feelings reigned, but to the world outside the Harrimans were cold, reserved, haughty. Democracy was not taught in the Harriman family.

The history of the family after 1866 may be very briefly dismissed. The oldest brother, John Nelson, died some years ago. The youngest, William McCurdy, has been dead but a little time. The second, Orlando, is living, and is active in real estate and tractions in Brooklyn, where he now lives. Miss Lily Harriman became the wife of Mr. Charles D. Simmons, of Brown Brothers & Co., New York. Miss Annie Harriman married a Van Rensselaer, a New York aristocrat known best

in his own circle. The father died in April, 1881, at Jacksonville, surrounded by all the comforts that wealth could buy. He was but sixty-eight at his death, and had suffered much for nearly twenty years.

YOUNG HARRIMAN IN WALL STREET

Edward Henry Harriman entered Wall Street late in the 'sixties, as a clerk. At that time he gave little indication of his ability. Socially, he was well-liked. He is described as having been full of fun and fond of society in the best sense of the term. He was noted, however, for a mind of his own. What he wanted he generally got, but his desires were neither very sweeping nor very important.

Many tales are told on Wall Street of the way he came to be able to buy a seat on the New York Stock Exchange, which he did on August 13, 1870. One, for which I have been able to find no authority at all, is to the effect that he was plunging in the market with all he possessed during the celebrated "corner in gold" engineered by Gould, Fisk, Kimber, and others of their kind, and that he took his profits on "Black Friday" and invested the whole of those profits in a seat on the Exchange. This matter is not clear, but better authority seems to lie behind the statement that in this venture into the Exchange he was assisted by a relative, one of the Oliver Harriman branch of his father's family. At any rate, he went in, in 1870, as a trader on the floor of the Stock Exchange.

He married early in life, and married very well. His wife was Miss Mary Averell, of Rochester, whose father was a capitalist and a successful railroad man. He is said to have made a large sum of money in the Rome, Watertown, & Ogdensburg Railroad. This marriage considerably strengthened the hands of Edward H. Harriman for the battle of life. It has been in every way a very fortunate and happy marriage.

So came to his own the man who was destined to become the greatest financial figure of a day of tremendous financial figures. It was a beginning humble enough. The story of the man from that time on is almost purely financial, yet Wall Street knows nothing about it. For nearly thirty-seven years this man has lived the life of Wall Street, yet there are few in the Street of Discontent who even know that he is a member of the Exchange or has ever been. Men who speak of him are apt to say that the time will come when he will "come a cropper," when he will be caught in a "corner," smashed in some great "raid," or ruined by some other stock market contingency. For such a critic, it might well be profitable to review the career of this man since he joined the Stock Exchange.

He came at a moment that was ripe for the making of men. He had gone through the terrors of "Black Friday." He had watched for some years the campaigns of those terrible gamblers, Fisk, Gould, Drew, and Vanderbilt. He studied them and their methods in every possible detail. Knowing them, he decided that he could go into the Stock Exchange and hold his own in spite of them. It was a time when men played the game with aces up their sleeves. Perhaps he learned sleight-of-hand to meet the occasion should it ever arise. Certainly, he had learned wonderful agility, a remarkable diversity, and an almost superhuman watchfulness before he ventured to put his head within this den of lions.

ON THE STOCK EXCHANGE

Of his individual trading there are, of course, no records. The reporting of the Stock Exchange had not at that time reached the effectiveness of its present day standard. He bought and sold on the market without exciting any comment, without disturbing the current of events. The very few of the old traders who remember him in those early days say that he was very quick, very active, seizing a profit where it appeared, taking a small loss quickly rather than risk a large one. It was a great period for "scalping" the market, and wealth came quickly to the nimble trader. At the end of his fifth year, men had come to recognize in him one of the few who could make money whatever way the market went, and who knew how to keep it when he had it.

Let those who think this man likely to be caught in some panic study for a moment the nature of the Wall Street market from which he drew his fortune. In 1871 and 1872, when he had been on the market but a little time, came the fires of Chicago and Boston, with their resultant panics. In the following year he watched the downfall of fifty-seven firms in the disastrous panic that followed the bankruptcy of Jay Cooke & Co. That panic lasted one hundred days. The year before, he had seen the Jay Gould corner in Chicago & Northwestern. In 1876, he helped to crumble into fragments the rosy dreams of those who had

built the "anthracite corner," and took his profits from the collapse of Jersey Central from $110 per share to $6.

These things had happened before Mr. Edward H. Harriman was thirty years of age. He had had a part in all of them. He spent his time on the floor of the Stock Exchange, watching for them. He learned from them many lessons of prudence and of daring, and not a single lesson of the lot has he ever forgotten. He put them all to good effect when the Grant & Ward failure and the "White Corner" came in 1884. Later, in 1890, when the world was shaken by the Baring collapse, he was able to stand still and watch the flood of panic swirling past him—quiet, cool, watching his moment to dash into the flood and out again.

One may trace through this period the making of the man, but only in the dimmest outline. He was not doing an individual task. He was but one of a thousand, trading on the floor of the Exchange. When one has pointed out the pitfalls of that first ten years, the panics, the great campaigns, and has said that he came through these greater, stronger, and richer than he began them, one has said almost all there is to say. He was not, in that day, a creator of anything new. He was merely turning over and over the things already in existence. The life and labor of a broker can be written in figures, and that is about all there is in it.

FROM BROKER TO RAILROAD MAN

It was not until 1883 that he came actively into the railroad field. At that time, he had come to be known as a capitalist, one of the few who had gathered together a great fortune in the ten troubled years between 1870 and 1880. He was credited with having in his strong box a fair list of stocks picked up at low prices in the various panics. Along in 1883, he was elected a director of the Illinois Central Railroad. He was at that time working in close friendship with Stuyvesant Fish, who was elected second vice-president of the road in the same year. Mr. Fish had also been a member of the Stock Exchange from 1876 to 1879, and the two young men went into the Illinois Central to work along together. In 1887, Mr. Harriman became vice-president, with Mr. Fish as president.

The seven-year period from 1889 to 1896 may be passed over briefly. Mr Harriman played no prominent part in it. He watched the struggle for traffic, the disastrous rate wars, the Bryan panic, and the utter collapse of the railroad world in 1893; but he appears to have done little or nothing to bring himself before the public eye during that time. In fact, by 1894 even his part in the Illinois Central had been largely forgotten, except by the closest students of events. He was doing what he had so well trained himself to do—lying back and waiting his time.

So he came to his destiny. Through the long night that came upon the business world in the early 'nineties he rested, making himself strong for the day that was to follow. He gathered about him money—his own and other men's. He had not been taken by surprise in the disastrous period; far from it. He had made money. He was still a member of the Stock Exchange, and he kept his finger always upon the pulse of the business world, which is the tape that runs through the tickers of the Wall Street offices. There was no other man more skilled to read the meaning of the fluctuations that were marked in the figures on the tape, nor any other quicker to act upon the knowledge that he gained.

This period from 1890 to 1897 may be considered a dividing line in the fortunes of Mr. Harriman. Prior to that time he had been a broker, and his slight departure into railroading was but an incident. Since that time, he has been a railroad man, and his operations in the stock market have been incidental. As a broker, in the twenty years between 1870 and 1890, he had gained a reputation for shrewdness, quickness, alertness, and daring. He had not achieved distinction, as had James R. Keene, for instance. He was neither the most spectacular nor the most solidly successful member of the Stock Exchange.

THE MAN AND HIS METHOD

Mr. Harriman was about forty years of age when he set his feet upon the path that was to lead him into sovereign power. Many of the characteristics of his boyhood had fallen from him. The friends of his youth describe him as frank, open, fond of gaiety and fun. The twenty-odd years of the Stock Exchange had effectually removed the frankness and the openness. In their place he had a studied reserve, a careful holding of himself in leash, a fixed resolve that no man should be able to guess the real thoughts and motives that lay within his mind. He had, by sheer effort of

will, made of himself a psychological puzzle. So he has remained to this day. His plans are deep in mystery, even to the men he calls his friends. They will know only a few weeks before the world will know, just what Mr. Harriman proposes to do in any particular event. In the matter of the 10 per cent. dividend on Union Pacific stocks last summer, there were directors who declared afterward that they had not the slightest idea that the dividend was to be over 7 per cent., even when they adjourned from the directors' meeting after delegating to the executive committee the right to declare the dividends as they saw fit.

His fondness for fun found vent throughout this period in mad cross-country riding with the Meadowbrook Club, in the driving of fast trotters bred from his own stud, in devotion to whist, and in many other similar pursuits. He has never been entirely a slave to work; diversion is one of his axioms. He has never taken to the show horses, as Judge Moore has; to the races, as James R. Keene; nor to the automobile, as W. K. Vanderbilt, Jr. He seems to like sport for its own sake.

The quality of directness, noted in his boyhood days, intensified as he grew older. It had been the moving force behind him as he progressed from penury to wealth. It was to be the power behind him to the end. In fact, it became and is to-day the one factor that stands out from his diverse character. It has made of him, in the popular fancy, a financial Juggernaut that stops for nothing. The Morgan forces withstood him in 1901, and he did not hesitate to create a situation that led to a panic in the Stock Exchange. Mr. Stuyvesant Fish, the comrade of his young manhood, withstood him in this last year, and he crushed Mr. Fish as he would an enemy. A hundred lesser instances of this same characteristic could be adduced.

When Mr. Thomas F. Ryan bought the Hyde stock in the Equitable Life a little time ago, Mr. Harriman decided that he wanted half of that stock, and that he wanted other trustees appointed besides those whom Mr. Ryan had chosen. He stated his proposition in these words:

"I will take half your stock. I don't know what it cost and do not care—provided you will agree to the appointment of two additional trustees who will be absolutely independent."

In discussing this matter on the witness stand, Mr. Harriman very succinctly described the habit of mind with which he handles matters of importance:

"What I was going to do myself, I had clear in my mind, and I had done it as I am in the habit of doing it!"

Mr. Ryan stated that Mr. Harriman had threatened that unless he, Mr. Ryan, consented to the arrangement, Mr. Harriman would "use all his influence against Mr. Ryan." Particularly, it was admitted, would Mr. Harriman use his political influence in such a battle, to secure hostile legislation at Albany. It was in reply to a question as to whether or not he had done anything of this kind that Mr. Harriman let slip the phrase which has since become a household word:

"Not yet!"

HIS INDOMITABLE WILL

This terrible directness stands out in every relationship of Mr. Harriman's life. Along in July, 1899, the Harriman Alaska Expedition reached the end of its charted course. Beyond lay the Bering Sea, huge, unknown, treacherous. It was time to turn back, but Mrs. Harriman wanted to see Siberia.

"Very well," said Mr. Harriman, "we will go to Siberia!"

They had not been under way an hour when the ship ran upon a hidden reef. Mr. John Burroughs, the historian of the expedition, tells the rest of the story:

> "Some of us hoped this incident would cause Mr. Harriman to turn back. Bering Sea is a treacherous sea; it is shallow; it has many islands; and in summer is nearly always draped in fog. But our host was a man not easy to turn back; in five minutes he was romping with his children again as if nothing had happened."

They went to Siberia. The fog was so dense and the charts so imperfect that they missed an island they had hoped to touch—but they went to Siberia. The master of the ship would have considered the expedition a failure if they had not.

Another, though a lesser, characteristic often noted is the feverish thirst for information, for facts, for impressions. He asks blunt questions, difficult of evasion. He is the man who "wants to know." It was this desire that led him, in the midst of his Union Pacific campaign, to devote months of his summer to a cruise to Alaska in 1889, into a far country, out of reach of the telegraph, even the cable. It was this, again, at the close of the Russian-

Japanese War, which led him to go to Japan, into a country beset with dangers. He wanted to know about Alaska and about Japan. He does not like to get his information out of books, nor from the lips of men. He wants to see it for himself.

A few years ago, bids were called for the construction of a few miles of macadamized road near Mr. Harriman's country estate. The bids ran regularly about $95,000 to $100,000 for this amount of road. Mr. Harriman wanted to find out about this matter, how much profit there was in it. His curiosity carried him so far that he himself put in a bid for the work at $25,000—and got it. Report says that it cost him about $75,000 cash to get that particular bit of information—if, indeed, he did get it.

HIS UNOBTRUSIVE CHARITIES

Men who do not know him write of the Harriman "money-madness." The charge is not well founded. He is not money-mad, as the late Russell Sage was money-mad. He desires money, but almost entirely for the power money gives him. He is not niggardly—far from it. One hears little of his philanthropy. One of his friends explains this fact.

"His philanthropy is the kind that shuts its mouth and opens its hands. When he gives, he always stipulates that his charity shall not be made a headline in a newspaper!"

That is the reason why the world has not heard of many things. Down on the East Side of New York, in a district ridden with poverty, stands a fine square building which was built at a net cost of nearly $250,000. It is a club for the boys of the district. It is free to all boys, has no religious trammels, has no "services," "classes," nor other bugbears to scare a healthy boy away. It was built by Edward H. Harriman. In the latest annual report, it appears that the expense of running if for four months, amounting to about $4,700, was met by "a trustee." Mr. Harriman might have concealed his bounty under the phrase but the secretary, in a moment of forgetfulness, wrote that this expense was met by Mr. Harriman. He also speaks, with feeling, of the interest taken in the institution by Mr. Harriman and all his family. It is no mere money-service, but real charity.

The home life of this man has always been beyond reproach. His two daughters, Miss Mary Harriman and Miss Cornelia Harriman, are very popular in their own rather exclusive set. The boys, Averell and Roland, are very young. A large part of the year is spent at Arden, N. Y., where the summer cottage stands. The estate is in the midst of the Ramapo Mountains, a very beautiful region. Reports indicate that the total amount of land under the control of Mr. Harriman in that section is well up to 30,000 acres—a veritable kingdom. It includes a stock farm and many other luxuries. There the Harrimans delight to do their entertaining. A week-end visit to the Arden house is said to be a real delight to the limited circle to whom its hospitality extends.

The city house stands in a section of Fifth Avenue noted for its quiet aristocracy. It is far south of the little area made fearful by the architectural extravagances of Senator Clark and some of his compeers. Just above it, on the other side of the street, stand the old Vanderbilt mansions.

When a man meets Mr. Harriman at one of his clubs, at his house, or at his office—just as likely at one as at another—for a "conference" on business matters, he finds a very different man from the purely social Mr. Harriman. In conference, this man knows exactly what he wants, and he evidently intends to get it. He makes his propositions flatly. Questions of money are of small import. It is a question of policy into which he will throw his finest effort. His idea of coöperation is that all men shall assist him in carrying out his plans. His conception of harmony in the Union Pacific is that no man shall lift up his voice and object to the dictum laid down by the President of the Railroad. He does not say flatly, "I am the King." He merely *is* the King.

. . . . . .

Recently, on a Western trip, he made, in effect, this statement concerning his functions:

"My work has been to harmonize different opinions held by the members of the board of directors!"

That statement went the rounds of the press and the people. As it ran on the tickers of Wall Street, it raised quite a lot of comment. The writer brought it to the attention of a man who once was a director of the Union Pacific, but is not now. He laughed:

"I guess the reporter got him wrong," he said; "I guess he really said, 'Harrimanize!'"

THE RAILROADS OF TO-MORROW

THE REVOLUTIONARY CHANGES THAT ARE CLOSE AT HAND

BY

HENRY G. DURAND

IN THE to-morrow of twenty-five years hence, a great contrast will be noted in the commerce of the great central cities. At the present time, over seventy-five per cent. of the overland traffic from points in the far West changes ownership at Chicago, Kansas City, and St. Louis. The time will come when these cities will lose this position. Up to the present moment, this fact has stood squarely in the way of a transcontinental railroad in the United States. Millions of tons of freight each year have been carried through the expensive region about Chicago, re-handled there at heavy cost, then forwarded to eastern or western points. This is sheer waste, and will entirely disappear within a very short time. The great middlemen of these central cities must seek new vocations.

For this matter of economy is still to be the basic principle of railroad operation. The whole problem will still be to get the cost of transportation down to bed-rock. The process of doing this will entail most sweeping changes.

DINING CARS AND SLEEPERS

In the passenger service, the Pullman Company will practically disappear. Long before the 25-year period is over, every railroad that can possibly do so will own and operate its own sleepers, its own dining cars. The Canadian Pacific and the Chicago, Milwaukee, & St. Paul have for years been successful in operating their own cars, and have made money at it. All the great systems will follow in their wake.

The business of the Pullman Company has been well conducted. It has been in many respects of great benefit to the railroads, taking from their hands a load of responsibility and labor during the two decades when the hands of the railroad makers were very full indeed of matters having to do with the construction of the roads. The contracts into which the railroads have entered with this company are very strict; indeed, in nearly all cases, so exclusive that no sleeping car other than Pullmans may run upon the railroad. The service is a hard-and-fast monopoly upon many of the railroads.

Signs are not wanting that the railroads are tiring of this monopoly, and signs are even more in evidence that the revolt against it will be backed up by the people and the legislators. The inclusion of this company as a "common carrier" under the Hepburn law, and the cutting out of the pass privilege to it as well as to the roads are signs of this change. Within the next few years the Pullman Company will probably cease the operation of sleeping cars and devote itself entirely to the building of them under orders from the railroads. This change, when it comes, will probably lead to cheaper accomodations for the travelling public, and better service in every way.

THE PASSING OF EXPRESS COMPANIES

The express companies will also disappear. Recently the Rock Island formed an express company of its own, which will take over the business of the United States and Wells Fargo companies on the lines of that system within the next three years. As the contracts run out on other railroads, this example will be followed. Already the Denver & Rio Grande has its own company, the Globe. Under the present arrangement, the railroads get but 50 per cent. of the total charge, while the express companies take the other 50 per cent. The arrangement is highly profitable to the express companies, but not at all satisfactory to the great bulk of the railroads. So true is this that the Southern Pacific and the Vanderbilt lines, at least, have tried to even up by buying great blocks of the stocks of the express companies.

The result will probably be that in the long run the express service will merge, to a certain extent, with the freight service. The rates will drop to a level probably considerably above the present rates on the highest class of

"accelerated" freight. The result will be that the volume of traffic to be moved in such service will immensely increase. It will be necessary on every trunk line to operate a service somewhat like the present "solid express trains," but much more numerous, between the big cities. A lot of traffic that now moves on the roads paying only the ordinary freight rates will move up into this class of transportation. It will undoubtedly become one of the most important departments of the up-to-date trunk line during the coming years.

RAILROAD TRUCKING SYSTEMS

Side by side with this development will come the entrance of the railroads into the trucking business in the great cities. At present the public is being plundered right and left in this branch of the transportation business. If a man ship a consignment of freight from a point in Brooklyn to Buffalo, he pays more for cartage at both ends than he does for the 500-mile haul. The buyer loses heavily. The railroad also loses, because the freight is apt to stand for days in the Buffalo terminals, tying up cars, entailing heavy expense in handling, and in many other ways causing waste.

These two barnacles upon the railroad business will disappear. The first step has been taken in the building of the Chicago Subway, owned jointly by many railroads. The success of it will be followed by the creation of great trucking systems in New York, Pittsburg, Philadelphia, Boston, and many other Eastern cities where freight centres in huge volume. No one can say just what form will be taken by this new growth, whether the form of independent companies for each railroad, or of great trucking systems owned in common by many railroads. In the city of New York alone, over $150,000,000 a year is spent on the hauling of traffic through the streets. Within the next few years this cost will undoubtedly be cut down by $50,000,000 through the systematizing of the traffic.

Following out these tendencies, glance at the results. A shipper in New York has, say, a carload of freight for Buffalo. He sends a message to the New York Central that the freight is here, ready for shipment. With the least possible delay, the railroad takes the freight out of his warehouse on its own trucks. It is delivered to the consignee direct, and as soon as it can be taken out of the Buffalo terminals. The process at the present time involves the use of an independent trucking company in New York at a high price, separate bills from this company and the railroad, and a third separate arrangement between the consignee and another trucking company at the Buffalo end. It also involves the notification of the consignee that the goods have arrived in Buffalo, and a wait until a wagon is sent for them. The railroad loses storage room in a terminal that is naturally congested, and loses also the service of the car during this wait.

The result will be a greatly accelerated movement of traffic. The American business man has learned patience, but he will not practice it forever. The shipment of goods, either by freight or by express, must be made easy and fast, in order to keep up with the demands of the business and industry of the country. It must also be cheapened. These two results can only be accomplished by some such method as that outlined above. It is not too much to say that if the gathering of the freight and express goods in the great cities should come into the hands of the railroads, the ultimate expense of shipments 500 miles or less would be cut down nearly 40 per cent.

DEEP CANALS TO TIDEWATER

Within this period, two events will undoubtedly take place that will change the whole railway map of the continent. One will be the creation of a new deep waterway from St. Louis, and perhaps even from Chicago, to the Gulf of Mexico. The other will be the building of a deep-water channel from the Georgian Bay to tidewater at Montreal. Both these propositions have at the present time very strong advocates.

The first of the plans is the more important from an American standpoint. It would make St. Louis or Chicago the headquarters of all heavy traffic for export. It would draw from the Atlantic seaboard ports all the exports of freight that need not be hastened. Grain, flour, lumber, even machinery, furniture, and kindred products would follow this line of export. Necessarily many days of time would be lost in such shipments, but time is not the all-important matter in freight traffic. The question is the great question of cheapness. If such a route can be created without too many locks, it will undoubtedly make these inland cities strong bidders against the Atlantic ports for all products of the great region to the west.

Such a development would not do away with

the transcontinental railway. The passenger business, the fast-freight business, and the transportation of traffic demanded by the population of the Eastern States will make such transcontinentals practically a necessity, even though the United States be divided by a deep waterway. It will, however, strengthen the tendency toward the building of direct lines from all parts of the West toward the river. There will be a struggle for supremacy along this waterway just as for a generation there has been a struggle for supremacy along the Atlantic Ocean, the Gulf of Mexico, and the Pacific Ocean. Wherever the great docks are located, the centre of the struggle will be found.

If Chicago become an ocean port from both sides, it will become the metropolis of the continent. If ships can load at the docks of Chicago for Europe either via the Georgian Bay or via New Orleans, there is no limit to the possibilities of this great city. There must be, however, a very radical change in the method of reaching the waterfront within its boundaries. The cost of handling freight through the city under present conditions must be eliminated entirely. In all probability, the difficulty would be met by placing the docks for ocean liners at a considerable distance from the city, at a point where traffic from all directions could converge without having to be carried through the present boundaries of Chicago.

The Georgian Bay Canal is still in the preliminary stages. Hon. Israel Tarte at one time became quite enthusiastic over the project, and it at that time occupied considerable space in the controversies that overran Canada with regard to the methods to be used in diverting the trade of Lake Superior from the Buffalo gateway. A project called the Trent Valley Canal has been partially built, the professed object of it being the creation of a new deep waterway from the Georgian Bay to Lake Ontario at or near Belleville, Ont.

The whole project, more or less moribund in the two years after the departure of Mr. Tarte from the Canadian cabinet, was revived with new force last year by a statement from Mr. James J. Hill to the effect that the canal will ultimately be built, and will command the traffic of the whole Canadian Northwest against all and sundry railroads that may be built or that now exist from Winnipeg to the sea. Mr. Hill made his statement in explaining the reasons why he intended to build his new railroad from Winnipeg westward. He intimated that if such a canal were built he could cut in half the cost of delivering Manitoba wheat at Atlantic tidewater. If his statement be founded on fact, the canal will undoubtedly be built within the next few years.

BRANCH RAILROADS TO SMALL TOWNS

The probabilities with regard to the development of the through lines of trasportation have here been touched upon. The branch-line creation is but hinted at. In point of mileage to be built, it will far surpass the main-line mileage. Within twenty-five years, there will not be in the whole West a fertile valley neglected. No railroad will be able long to maintain the present Union Pacific policy of neglecting the building of branch lines. Just as the Pennsylvania, the Baltimore & Ohio, and the New York Central have found it necessary within the past twenty-five years to buy or build branch lines into every town that could be reached, so also the Western railroads will be forced to expand, to buy or build, to reach out into the neglected corners where traffic grows. In the wheat and corn belts, no field will be twenty-five miles from a railroad in 1930. Mr. Hill's famous statement, "All trails lead to the Great Northern," will become "The Great Northern meets all trails half-way."

Following along the line of the Union Pacific Railway from Omaha to Ogden, one notes but four branches toward the north in all that stretch of country. Two of them are very short, and the other is really the main line to Oregon. Within the next twenty-five years, these branches will become not four but forty. Even now, through a recent awakening, the engineers are pushing spurs northward. That whole region has lain waiting through the years. It will not wait longer. There will be built up a perfect network covering every mile of Nebraska and Wyoming that can produce tonnage, either under irrigation or without it. The same thing will happen in Texas, and, notably, in Oregon. The building of railroads within the 25-year period will probably create in those states a local railroad system almost if not quite as dense as is the system of Iowa to-day.

This whole railroad plan of development is based upon one single factor—the elimination of waste in transportation. At the present time

there is an immense amount of waste; yet it is less than half the waste of ten years ago. The largest part of the waste, both then and now, is entailed through efforts to carry traffic by artificial channels, to direct it from the line of least resistance into the line of greatest profit to the transportation company. Only very recently has it come to be recognized by the railroads that the carrying of grain from Nebraska over the Alleghanies was a wasteful and foolish practice. With this recognition came the granting of a right to make lower rates to Europe via the Gulf of Mexico. This is but an illustration of the tendency that will within the next few years lead to an entire reconstruction of the general scheme of railroad traffic in the United States. Ultimately, even the export tonnage out of Pittsburg may find its way through New Orleans, harking back to the days when the waterways of the Ohio and Mississippi carried all the tonnage out of the valleys of western Pennsylvania.

Toward the same end, the advocates of a deep-water canal in place of the Erie canal are struggling. Perhaps the expenditure of the $100,000,000 now authorized will place New York again upon a footing with her Western rivals in the matter of slow-freight transportation to tidewater. If it does not, New York must continue to fall farther and farther behind. The tremendous expense of lighterage in this harbor must be eliminated in one way or another. No mere sentiment will stand in the way of a commercial necessity. The cost of getting the products of the West must be cut down to bed-rock, even though the commercial supremacy of New York be lost in the course of the struggle.

SWEEPING MECHANICAL CHANGES

Along this same line will be the change in the character of equipment. This is not so true of passenger as of freight equipment, though it holds in both departments. It is limited in the matter of passengers by the fact that the man will pay for speed, while the freight will not, as a rule. Of course, railroad construction will see radical changes within the period. Where the great trunk lines now spend $5,000,000 to get a grade of fifty-two feet to the mile, they will ultimately spend $15,000,000 to get a grade of only ten feet. This is the first requisite of economy. In this age, men have seen the Southern Pacific spend $8,000,000 to save a few miles and a couple of hundred feet of climb around the head of Salt Lake. Within the next five years, they will see again the same road spend nearly if not quite $10,000,000 to save a few hundred feet of climb over the tops of the Sierras. Within the next few years, the Santa Fé will abandon the La Junta route entirely for freight, and carry its traffic down through Texas. Every great railroad will follow out this plan. In the year 1930, it will be impossible for any trunk line, East or West, to hold its own in the transportation of freight unless its grades are far better than they are to-day.

In equipment, the most radical changes may come. We are upon the eve of great inventions. No man can say how far they will run. The progressive young railroad superintendent of to-day sees visions of things his father never heard of. He sees thousands of cars scattered over the branches of a great railroad system, each under its own power, gathering together the freight from little local towns. He sees them run together to some great central point, to be made up into trains of 100 or even 200 cars for the long journey across the continent, or down to the ports of the Gulf. He figures out new systems of handling freight, each more economical than the last.

A VISION OF THE NEAR FUTURE

Merely by way of illustration, here is a fancy out of the West. Freight is gathered on all local lines and branches by small trains under their own power, say, gasoline. The trains from the main line west of Kearney to Cheyenne and from all the branches within that section of the Union Pacific, gather to the yards of Kearney. As they come in, the fastenings that hold the main body of the car to the trucks are thrown off. Great cranes pick up the cars, weighing from 50 to 100 tons, and swing them to long rows of flat cars, pulled by a mighty engine. Solid trains are made up for New York, New Orleans, Chicago, St. Louis. Other trains are put together for local points a hundred miles away or more. Cars of freight for many points are sent into a sorting yard, picked over, and their freight transferred to cars to be made up into a "peddling train." All the big main-line trains are pulled by locomotives, just as they are to-day. When the through trains are up to the capacity of the locomotive, they are sent out, and the building of other through trains is begun.

The trucks of the cars that have been trans-

ferred are run to another yard, and west bound cars are swung from the solid trains to them. Freight immediately starts out toward Cheyenne and all the local branches. There is no effort or need to hold trucks at this point for full trains, for there is no waste of power in running even a single car under its own engine. The freight that has come in in full trains of perhaps a hundred cars from the East is scattered immediately throughout the West. The long trains of flat-cars that are emptied are prepared to receive the next day's eastbound freight for transport to eastern points.

This vision is based upon the sound economic fact that the gathering of local freight in "thin" territory by means of the locomotive is wasteful. An engine that can pull fifty loaded cars goes out to pick up cars at sidings all along a branch 200 miles in length. For the first ten miles, it pulls nothing. For the next ten, it pulls two cars. Even when it has picked up the last loaded car on the branch, it has not a full load. It has wasted its power all along the line. It is an extravagant system. The masters of the railroad world are even now dreaming, planning, trying to devise some other method that shall not waste the power of a locomotive in the doing of a horse's work. Perhaps the individual-power freight car is the last solution of the problem.

The making up of through trains of enormous weight, to be pulled by the most powerful locomotives possible, is the method of to-day. Mr. Hill has done much to teach the wisdom of it. On the great trunk lines they carry it even further. It is a cardinal principle of the day in railroading. The railroad president who dreams of trains to carry 2,500 tons of freight across the continent, or out of the heart of Nebraska to New Orleans, is but carrying onward the tendencies of the day. That part of the dream will surely be fulfilled in time.

A REVOLUTION IN MOTIVE POWER

The question of motive power comes up in every railroad convention to-day. There are hundreds of engineers breaking their hearts over the struggle to perfect the science of power. Scientists claim that out of every ten tons of coal burned in the most perfect steam engine of to-day, nine are wasted. In other words, one ton of coal should do the work that ten tons do now. Following this trail, wise men have been experimenting for years with an "internal combustion" engine. Perhaps they hold the secret of the future of the railroad in their hands. More likely they are just playing around it, stumbling over little obstacles. Within the next few years, it is more than probable that some one of them will stumble over the invention itself—and then the problem will be solved.

Other men claim that electricity, gasoline, alcohol, are the solution of the question. Perhaps each will help. It is not at all unlikely that the alternating current will dominate the passenger traffic of the East within five years. Nor is it beyond the bounds of reason to suppose that alcohol and gasoline have a fighting chance to take the place of steam in the gathering of freight and the distribution of passengers on local branches. In fact, these factors, or others like them, are recognized as certain developments of the next twenty-five years.

It would not be a wise thing to turn from this study of the railroad tendencies without pointing out that the progress of the next twenty-five years cannot be continuous in every way. There has been to this date a long, steady, cruel rise in prices, in the cost of living, in the cost of laboring, in the cost of building. There must be a check to this rise, and a very great check. The Western Pacific is paying over $3.00 a day for ordinary labor, and cannot get enough of it at that. The people must get good wages, or they cannot live. There must be a great set-back. It may come from two or three years of crop failure in succession, the wrecking of industries, the ruin of railroads. It may come from war or pestilence, here or abroad. From whatever source it come, and however terrible it be in the passing, it is almost an economic necessity. But it will be the beginning of an era of expansion and national growth unparalleled in the history of the world.

American railroads have reached a turning point in their development. For the last fifteen years the tendencies have been well defined. The chief of them were toward consolidation of great systems; toward the upbuilding of the main lines to meet heavier and heavier traffic between the cities; and toward an increase in the capacity of cars and the power of locomotives.

THE GREAT RAILROAD DIVIDE

At the moment, these tendencies are checked. The public mind is aroused against further consolidations of competing railroads. The

popular delight over the Northern Securities decision, and the popular clamor against the purchase of the Illinois Central by Mr. Harriman are unmistakable signs. A recent statement from Mr. James J. Hill regarding the need of 100,000 miles of new railroad has been welcomed and applauded from one end of the country to the other. The people demand more branch-line railroads, to open up new country. The building of the main lines must give way to the building of branches. In the matter of equipment, a controversy rages between the advocates of still heavier cars and power, and those who think the limit has been reached.

The railroad corporation in 1931 will occupy a new relationship toward the people of the United States. The open defiance of the people's will which is rampant at the close of 1906 will disappear, and shortly. The people must rule. Taking this as an axiom, that the will of the intelligent public will become the basis of railroad law and railroad management within that period, the new tendencies stand out quite clearly.

The consolidation of competing railroads, even their common ownership, will cease. No law can be created which shall take from an individual his right to own the stocks of competing railroads. Therefore, the law must remove the motive for such ownership. The first step toward such removal has been taken. The Hepburn law of 1906, imperfect as it is and more imperfect as is its machinery, will be but the foundation upon which the people will build a code of laws which shall forever make it unnecessary to consolidate railroads in order to make sure of equable rates. The Pennsylvania bought into the Baltimore & Ohio in 1899 in order to stop destructive rates. There will never again be need of such purchase.

This must go much further. The maintenance of rates is but one of the motives that lead to mergers. An even stronger motive is the desire to control the distribution of freight. For instance, the so-called Harriman-Standard Oil interests have but recently bought a large interest in the Santa Fé and the San Pedro, so as to be able to have a voice in the apportionment of the traffic out of California. This motive will be eliminated within the next few years by pooling the traffic at all great distributing points. The traffic will be controlled by the railroads under government regulation and apportioned to the railroads on a fixed percentage basis.

It will take many years to reach this point. It will be the leading issue in more than one Federal campaign. In the long run it will triumph. The people will come to see the difference between a mere railroad pool to keep up rates, and a railroad pool under government control to eliminate the greatest impetus toward consolidation.

TRUNK-LINE CHANGES

The struggle toward this perfect rate regulation and this perfect distribution of traffic will be long and very bitter. In the course of it, many of the great mergers of to-day will disappear. There will be a gradual segregation of one system from another. The profit of the Union Pacific control of the San Pedro and the Santa Fé, if this latter be now contemplated, will disappear. Gradually, without direct force from outside, the giant holding companies will drop more and more of their stocks. The law is to be made the instrument of the people's will, rather than a shield against that will.

It is not to be understood that the will of the people is toward the entire destruction of the great railroad systems. Indeed, it is very far from it. No man objects to the purchase of new branches, the merger of lines to make a central system. That process, which created the Pennsylvania, the Southern Pacific, the New York Central, is recognized even at this day as beneficial to the railroad as well as to the people. There will be no disintegration of the systems. There will be merely a passing of the holding company which is designed to consolidate competing railroads.

TRANSCONTINENTAL RAILROADS

In place of the consolidations of to-day, there will come an era of the creation of transcontinental railroads. At this moment, one is in existence and four are in the making. The Canadian Pacific spans the continent. The Gould system, the Harriman system, the Grand Trunk Pacific, and the Canadian Northern are reaching out for lines from sea to sea. By 1910 all these will be in operation, and many others will be making. This tendency will land the Erie Railroad in the hands of a Western system. It will carry the Chicago & Northwestern to Seattle to make a Vanderbilt Overland. It may carry the Rock Island to both coasts.

THE ARMY OF CHINESE STUDENTS ABROAD

THE 10,000 PICKED MEN WHO WILL CONTROL THE DESTINY OF THE NEW CHINA

BY

C. S. WALKER

FEW events, if any, ever witnessed in the village of Amherst, Massachusetts, the seat of two colleges, have had deeper significance than the weaving together last summer of the Stars and Stripes and the dragon of China on its field of yellow. Beneath the mingled flags of the young republic of the West and of the oldest nation of the East were a hundred young men from the best families in many provinces of the Celestial Empire. And—stranger still—among them were a few female students.

These Chinamen were dressed in American style and wore no queues. There were athletes among them and there were men of iron nerve and abundant vitality condensed into bodies of medium stature. They talked in different dialects and many were strangers to one another in a strange land, but all spoke English as their common speech. Among them were students from the leading colleges and universities of America, who had not only held their own in competition with the Anglo-Saxon but had even snatched from him the coveted honors. All were animated by the same spirit and their college yell was "C-H-I-N-A—the new China!"

This unusual assembly was a conference of the American branch of an international movement, the World's Chinese Students' Federation, organized at Shanghai on July 1, 1905, with Teng Hwee Lee, a graduate of Yale, as its president. Branches have already been established in several countries and the membership has increased rapidly in numbers and in influence. It publishes the *World's Chinese Students' Federation Journal*, edited by a board of four, three of whom are Yale graduates. It is printed both in English and in Chinese and has a wide circulation. It stands for intense loyalty to the Chinese government and for a self-sacrifice akin to that shown by the Japanese. It advocates all learning for all the people, the necessity of a common language, and, above all, the creation of national unity.

CHINESE STUDENTS IN AMERICA

According to the register at the embassy in Washington, there were 300 Chinese students in the United States last year, 173 of whom had reported to the minister and were subject to his oversight. Of these, 49 were government students, sent over by viceroys of provinces to be prepared for public service, and 124 were private students. These young men were distributed among the following institutions: Yale, Cornell, Columbia, University of California, Massachusetts Institute of Technology, Virginia Military Institute, New Bedford Textile School, Massachusetts Agricultural College, Phillips Academy, St. Louis Medical College, and the high schools of Amherst, Springfield, Hartford, and San Francisco. In addition to these regular university students, there are also Chinese theological students, sent to America by missionaries of various denominations. These students are scattered among the theological seminaries and other schools under denominational control.

Last summer, Dr. Charles D. Tenney, a Boston scholar who went to China and became the founder of the Tien-Tsin University under the patronage of the Pei Yang Government, brought a company of forty young Chinamen, collected from five different provinces, to the Harvard Summer School. Last fall he saw them matriculated in the several colleges of their choice. They are from fourteen to twenty-four years of age and have been well prepared for the courses of study upon which they have entered. All speak English and many of them are familiar with French or German also. The sons of government officials or merchants, they have been selected because

of superior scholarship and proved ability. Some of them will study engineering and others will devote themselves to political science. This delegation has been sent as the forerunner of a series of annual delegations which Yuen Shih Kai, the viceroy of the province of Chihli, who is a leader of the educational movement in China, is planning to send to England and America. It is probable that a similar band will be sent next year from Nanking.

The origin of the movement for the education of Chinese youth in foreign countries dates back to 1847, when the Rev. Samuel M. Brown brought from Hong Kong to New York City a bright Chinese boy, eighteen years of age, by the name of Yung Wing. He was fitted for Yale College and entered the freshman class in 1850, graduating in 1854 with honors in English composition. Returning at once to his native land, he made a fortune in trade, then lost it through the mismanagement of his partner during an absence in the United States. On his return home, in 1864, he was made a mandarin. While serving as an interpreter for the Chinese Government, he finally convinced Li Hung Chang that if Chinese youth were sent to America to acquire the Western learning, they would become of great service to China.

In 1872 the first band of thirty Chinese boys, selected from the best families, was sent to New England. Other delegations followed until one hundred and twenty Chinese students were located in homes throughout the Connecticut Valley. They were taught English and, as soon as they could be prepared, were sent to Williston Seminary, to Phillips Academy, Andover, and to other suitable schools. At first, all were under the oversight of Yung Wing, who had his headquarters in Hartford. The students reported there at stated intervals for instruction and examination in the Chinese language and classics. They wore their queues and were expected to maintain Chinese customs. Their government appropriated $8 a week for each student and he was allowed $1 additional for spending money. The boys and their teachers both did excellent work and Yung Wing was delighted with the progress made. In the light of recent events, the following words, written by him more than twenty-five years ago, now appear to have been uttered with the inspiration of a true prophet: "I am looking to the influence which the United States should have in shaping the destiny of the New China that is imperceptibly and slowly looming up on the horizon of the East. The mass of the people have been kept down too long. Ages of depression and repression of the Chinese mind must be lifted up and each individual man must assert its integer and integrity and have full liberty to develop himself and bring himself nearer to his God. American training is best adapted to accomplish this." Yung Wing's phrase, "The New China," has become the watchword of the twentieth century.

But a bitter disappointment awaited him. Appointed to the post of Chinese minister at Washington, a new commissioner of education, Woo Tsze Tun, was sent from China to look after the boys. This new man, opposed from the first to the education of Chinese youth in America, reported to Peking that the boys were becoming denationalized, that they were losing their reverence for the Chinese classics, and should be recalled at once. The students were ordered home in the autumn of 1881, just when they were beginning to get the most profit from their training.

A memorial, signed by the teachers of these students and endorsed by many of the presidents and professors of American colleges, was forwarded to the Chinese Government through the State Department at Washington. Just when this memorial was about to secure the return of the students, Congress passed the Chinese Exclusion act and all negotiations came to an end. But Yung Wing, now at the age of seventy-seven, has lived to see his great work for the education of Chinese boys in the learning of the West about to result in a successful issue.

Sir Liang, the Chinese minister at Washington, spoke with authority when he said: "There is no more encouraging sign for the modernization of the ancient Empire than the sending of bright young boys of good family to other countries for education. I am led to believe that my government will not only continue, but also increase, the sending of boys to the United States for an education. The necessity of the time demands it and we need thousands of them."

CHINESE IN JAPANESE SCHOOLS

The eyes of the Chinese were first opened to the practical benefits of Western education during their war with Japan. Since 1896, their students have been flocking to Japan in increasing numbers, to sit in the schools of their conquerors.

At the present time it is estimated that at least 10,000 Chinese students, mostly from the interior provinces, are in Japan. Half are self-supporting; the others are maintained by the national government or by their own provinces. They vary in age from thirteen years to forty. In Japan they are received into government schools and private schools, some of which have been established especially for Chinese. The majority are studying engineering, law, military science, and medicine. Others are learning railroading, photography, weaving, and soap-making.

But while the number is large, the work accomplished is for the most part confined to elementary subjects. The higher learning is mastered by only a few. Of those going to Japan, nine-tenths arrive without any knowledge of the Japanese language and with no adequate preparation, and therefore must spend some time in primary schools. Half of them return to China after a year or two without having completed a secondary course. A little knowledge is a dangerous thing for these men, easily swayed by strange doctrines and revolutionary ideas. The advice of the best educators now is to send only well-prepared students to Japan and to Western nations, and to use the money thus saved to establish good schools at home.

A Chinese superintendent of education generally has charge of the students in Japan. An allowance of $12.50 a month is granted to each student under government patronage, the money being given to the school authorities to be disbursed under their direction. Rules of conduct have been prepared by the Hankow viceroy and the Japanese minister in China, but the Japanese authorities do not strictly enforce them. Obedience brings rewards, while only crimes are severely punished. Degrees won in Japan are honored in China equally with the corresponding Chinese grade. In 1905 there were 411 Chinese graduates from Japanese institutions. Of these, many returned at once to China as teachers.

The centre of Chinese student life in Japan is Tokyo, where there is a club of 4,500 members, with a well-equipped clubhouse. Here the greatest freedom of thought and speech is allowed. Political questions are discussed and governmental action is criticised without fear, in genuine student fashion. Innumerable influences emanating from this centre are spread throughout China by magazines, pamphlets, and newspapers. They advocate the building of railroads with Chinese capital and the adoption of the Mandarin dialect as the common speech, in order that by these two means national unity may be secured. Education of the people must prepare the way for parliamentary government. The large number of Chinese students in Japan is explained by the ease with which the Japanese language can be learned by them and the moderate expense compared with that of attending Western institutions. Besides, the Chinese already in Japan work together to help new students to establish themselves.

THE CAREER OF SIR LIANG

The story of Sir Chentung Liang Cheng, the present minister to the United States, is a striking proof of the value to China of training a boy in America. Born on the island of Wampoa, near Hong Kong, he traces his ancestry back 2,000 years. He inherited from his fathers a splendid physique which has developed into a man exceeding six feet in stature, with broad shoulders, powerful muscles, a pleasing countenance, a winning voice, and a nervous temperament capable of most efficient labor.

A boy of thirteen, he passed severe civil service examinations and, under the name of Liang Pi Yuk, joined the band of 120 Chinese boys which was sent to the United States through the influence of Yung Wing. He became a pupil in the home of Miss Julia M. Harrington, in Amherst. He was a diligent student, but found time to enter heartily into the sports of his American playmates, who called him "Pi Cook" and gave him a warm welcome. "The experience of my boyhood has attached me with particular affection to this village," he said recently, "and I have sent hither a few Chinese students from the first families of the Empire." Among those now studying in Amherst are his own son, Arlu; his brother, Liang Cheng; his nephew, Liang Hing Luen; and his prospective son-in-law, Jen Huan.

"Pi Cook" soon mastered the English language and was sent to Phillips Academy, Andover, where he won high praise as a student and fame as an athlete. Speaking of baseball in an after-dinner speech delivered at the 125th anniversary of the Academy, Sir Liang gave a most interesting account of his smashing a "three-bagger," which won for his nine the championship in 1881 over Exeter Academy. His ambition to enter Amherst College and graduate with the class of 1885 was disap-

pointed by the summons of the Chinese Government to return home, a disappointment that must have been keenly felt.

But Liang Pi Yuk could not be suppressed. Too good a man to be long ignored, the government first sent him to the naval school at Tien-Tsin but later promoted him to the diplomatic service. From 1886 to 1889 he was connected with the Chinese legation in Washington. In 1895 he was taken by Li Hung Chang to Tokyo in the capacity of secretary when the treaty of peace was made between China and Japan. As first secretary, he accompanied the embassy that was sent from China in 1897 to attend the jubilee of Queen Victoria. In 1901 he was the companion of the Chinese Emperor's brother who went to Berlin to apologize, on behalf of the Chinese Government, for the murder of Baron von Ketteler during the Boxer rebellion.

When the term of Wu Ting Fang, the late Chinese minister to the United States, expired in 1903, Sir Liang was sent to this important station. He is now serving his second term in that capacity.

OTHER AMERICAN GRADUATES

Sir Liang is only one among many young men trained in other lands that have risen to distinction. Lin Leun Fai, of the class of 1882, Phillips Academy, became a skilful physician; overcoming the prejudice of the Chinese against foreign medicines, he succeeded in persuading his government to establish the Tien-Tsin Medical College and hospital. During the war in 1900, this institution was protected from injury because of his wisdom in opening the hospital to all nationalities. Lew Yuk Lin, of the same class at Andover with Fai, rendered important service to China in the consular and diplomatic corps at important posts in Europe and America. Wo Ying Foo, of an earlier class, won distinguished honor in the Chinese navy. As commander in the battle of Yalu, his bravery secured from the Imperial government the "Batulu," the Victoria Cross of China.

Tsoa Kai Cheong, who was trained in Massachusetts, rendered valuable service to China during the Japanese war. While commanding as gunnery captain on the flagship *Ting Yuen*, at the battle of the Yalu, he was severely wounded. He retired from the navy for a time, but in 1898 he was assigned to the command of the new cruiser *Hai Yung*. His latest achievement was the organization of a police force of 1,500 men to keep the peace of the city of Tien-Tsin. So well did he succeed in this innovation that other provinces have adopted his system. For his meritorious service he has received a rank in the Chinese army corresponding to our Brigadier-General.

THE DAWN OF A NEW CHINA

But important as is the work of Western graduates in the military, naval, and diplomatic service of China, it is in the fields of education and material progress that their efforts are showing especial efficiency. It is through the development of Chinese mines, the introduction of modern methods of agriculture, the application of steam and electricity to manufactures, and the building of railroads that the Imperial government is now planning to create a New China.

Already the fruits of this student movement are seen in the establishment of modern schools throughout the Empire; in the introduction of Western sciences into the courses required of those taking the civil service examinations; in the revision of the criminal and judicial code by a commission of which Wu Ting Fang, formerly minister to the United States, is a leading member; the teaching of the Mandarin dialect in the schools, with the design of making it the national language to take the place of the numerous dialects which now divide the people; and especially in the Imperial decree promising parliamentary government as soon as the people can be made ready for it, probably within the next five years. When these sweeping reforms are in full swing, foreign-trained students will be needed at the helm.

EDUCATION FOR CHINESE WOMEN

The sending abroad of five High Commissioners to investigate systems of female education, and their report advocating Chinese schools for women, recalls an interview between the Dowager Empress and Sir Liang, as he was leaving China for Washington.

"I have been advised," said this remarkable woman, "to introduce into the Empire schools for girls. But I have noticed that as soon as women begin their pursuit of learning they are seized with the mania for meddling in politics."

Sir Liang's liberal New England education rose to the occasion. "Your Majesty's subjects rejoice," replied the diplomat, courteously, "that the four hundred millions of China have for their ruler an educated woman!"